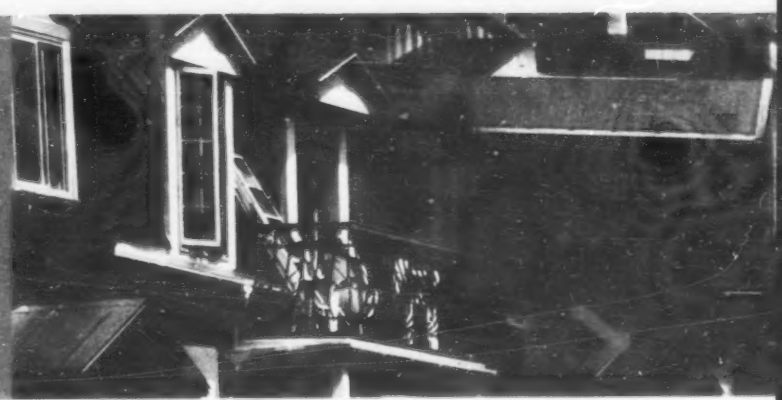
RESEARCH REPORT

SERVICE LIFE OF MULTI-UNIT RESIDENTIAL BUILDING ELEMENTS AND EQUIPMENT

HOUSING TECHNOLOGY SERIES



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CANADA MORTGAGE AND HOUSING CORPORATION

SERVICE LIFE OF MULTI-UNIT RESIDENTIAL BUILDING ELEMENTS AND EQUIPMENT

FINAL REPORT

MAY 2000

This research project was funded by Canada Mortgage and Housing Corporation ("CMHC"). The contents, views and editorial quality of this report are the responsibility of the author(s) and CMHC accepts no responsibility for them or any consequences arising from the reader's use of the information, materials and techniques described herein.

CANADIAN CATALOGUING IN PUBLICATION DATA

Main entry under title :

Service life of multi-unit residential building
elements and equipment : final report

Issued also in French under title : La durée de vie utile des
matériaux et équipements techniques des édifices résidentiels
de moyenne et de grande hauteur.
ISBN 0-660-18253-X
Cat. No. NH15-367/2000E

1. Buildings—Canada—Performance.
2. Buildings materials—Canada—Service life.
3. High-rise apartment buildings—Canada—Maintenance and repair.
I. IBI Group.
II. Canada Mortgage and Housing Corporation.

TH453.S47 2000 658.2'02 C00-980380-7

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Printed in Canada
Produced by CMHC

101-04280/

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Service Life of Multi-Unit Residential Building Elements and Equipment

ABSTRACT

Maintaining Canada's housing stock requires timely investment of funds for replacement of building elements and equipment. CMHC engaged IBI Group to survey experienced building professionals across Canada to obtain real life, non-theoretical estimates of service life for over 230 components in apartment buildings over five storeys high. The information was collected through a three-stage survey and analysis process resulting in an average high-end and low-end estimate of service life for each building item. The resulting range was then divided into approximately equal three sub-ranges: below average, average and above average length of service life. Using a model building, costs were developed based on specific assumptions for length of building life, inflation rate for construction and discount rate. This information produced a range of annual contribution amounts necessary to maintain the reserve fund. This report summarizes the study, lists the results and describes a process to make immediate use of the information.

A generic reserve fund cash flow model has been prepared as part of this project. You may obtain a copy of the Excel spreadsheet from the following URL address:

ftp://ftp.cmhc-schl.gc.ca/servicelife

EXECUTIVE SUMMARY

This report summarizes the results of a Canada-wide study to determine the service life of building elements and equipment in multi-unit residential buildings, and possible implications for replacement/ reserve funds.

BACKGROUND

Reserve funds are an important means of providing capital to conserve multi-unit residential buildings and other structures. The size of the annual contribution to the reserve fund is directly related to the length of life of the various building elements and equipment needed to be replaced/repaired. By extending the service life of the elements, the reserve fund and the annual contributions needed to sustain it can be reduced.

IBI Group was engaged to carry out a Canada-wide Delphi study of experienced building managers and selected construction materials specialists to get opinions based on years of experience on the possible length of service life of apartment building elements and equipment. This survey also collected information on the most important factors affecting the length of service life for each of the 232 elements/ equipment that form the subject of the study.

FOCUS AND SCOPE OF REPORT

This report focuses on the background and objectives of the study, the methods used, including sample questionnaires from the first two rounds of the Delphi process. Next, the report describes how a model building was selected and used to estimate the cash flow and reserve fund implications for the average high and low-end length of service life. The report provides a below average, average, and above average service life range for each of the 232 elements. By way of comparison, the report includes a table developed by the Ontario Housing Corporation, indicating life expectancies for residential building elements. Finally, the report explains how to use the findings for projecting replacement activities and cash flow needs.

METHODS

A wide range of housing management organizations were contacted to solicit participation in the Delphi process. In addition, building materials specialists from manufacturers and building materials associations were also encouraged to participate. A total of 54 managers and building materials specialists responded.

The Delphi process was carried out in three steps. In the first step, participants were invited to select what was, in their opinion, a typical low-end service life and a typical high-end service life, and indicate which two of a list of eight factors most strongly influenced the length of service life. In the second round, the participants were provided with a questionnaire that indicated the high and low average for each element obtained from the first round together with their answer for each of the elements in the first round. During the second round they were asked to make any modifications they wished to their original estimate based on what they saw as an average from the first round and any additional thoughts they had since their first response. The second round questionnaires were analyzed, and a number of respondents whose response varied significantly from the overall average on selected elements were contacted to discuss the reasons for their choice. In some cases, modifications were made to produce the results for the final round.

FINDINGS

Appendix C provides the result of the Delphi survey organized in ranges below average, average and above average service life for each of the 232 elements.

The comparison with the OHC life expectancy table indicates that the elements in these tables have a lower service life than the median service life indicated by the experience of the survey respondents.

The sensitivity of annual reserve fund requirements is dependent upon three factors: length of service life of the elements and equipment, assumed length of life of the building as a whole, and the rate assumed for construction cost inflation. As a proportion of construction replacement cost, the annual reserve fund contribution amount varies from as low as 0.8% to as high as 4.5% depending upon construction inflation and the desired length of building life.

USING THE FINDINGS

Using the findings involves building managers deciding what range of the three provided to select for the service life so that they can compute cash flows and contributions to annual reserve funds. For older buildings, an added complication is the need to estimate remaining service life of the elements and to select the desired remaining life of the building as a whole.

A generic reserve fund cash flow model has been prepared as part of this project. You may obtain a copy of the Excel spreadsheet from the following URL address:

ftp://ftp.cmhc-schl.gc.ca/servicelife

1.0 NEED FOR BASIS TO ESTIMATE RESERVE FUND REQUIREMENTS

Owners of apartment buildings are becoming increasingly aware of the importance of reserve funds to enable them to maintain their investment in acceptable condition. This applies to both rental and condominium buildings as well as new and old buildings. The length of life of building elements, components and equipment is the primary factor which determines the cash flow needed to make replacements, and thereby maintain the useful life of the building.

CMHC has recognized the need for practical information for building owners and managers regarding the investment needed to maintain and protect Canada's multiple housing stock. CMHC commissioned IBI Group to carry out a study to collect information on "real life/non-theoretical" estimates of service life of building elements, components and equipment. IBI Group analyzed the responses and tested the information on a model apartment building to illustrate annual reserve fund requirements.

2.0 REPORT PROVIDES INFORMATION FOR BUILDING OWNERS, MANAGERS

The primary purpose of this document is to provide building owners with tables of service life spans for building elements, and the most important factors affecting the life span. In addition, the report illustrates a range of annual reserve fund contribution rates depending on the length of life of the building elements, rate of construction cost inflation, and two different assumed life spans for the building as a whole. The report concludes by providing an outline of steps to take in using the information.

3.0 SCOPE FOCUSES ON APARTMENT BUILDINGS OVER FIVE STOREYS, EXPERIENCE GAINED ACROSS CANADA, AND COST SENSITIVITIES

The scope of this report (and the study on which it was based) focuses on apartment buildings over five storeys in height, the major building elements (excluding those found inside individual dwelling units which are, for condominium units, the responsibility of individual occupants). Actual experience is taken from apartment building managers and other building professionals across Canada with at least 10 years' experience. The information collected on the length of building component life was used to test the sensitivity of reserve fund needs in relation to the length of building element/component life and costs.

4.0 OPINIONS ON LIFE SPANS FROM BUILDING PROFESSIONALS, COSTS BASED ON MODEL APARTMENT BUILDING

The information below describes the sources of information and method used for:

- estimating life span of building elements;
- exploring the significance of the elements life span in terms of comparative cost;
- computing alternative annual reserve fund contribution requirements resulting from life span and other factors.

A more detailed explanation of the study methodology and results are included in working papers provided to CMHC by the study team.

4.1 SERVICE LIFE ESTIMATES

Estimates of average low-end life span and average high-end life span were collected by questionnaire. This involved using a multi-stage inquiry process which allowed the respondents to modify their opinion based on further reflection and after viewing the averages produced by their peers at each stage. This approach, known as a Delphi survey, consisted of three distinct steps. For the first step, a list of some 232 building elements (including the same elements made of different materials) was developed in questionnaire format to allow respondents to enter the estimates for low and high-end length of service life and select from a wide range of factors influencing service life. The averages analyzed from the first round were included in a second questionnaire which was sent to each respondent. That questionnaire also included the response for each of the elements from that respondent from the first round. The respondent was then permitted to modify his/her response to form the second round. The results of the second round were analyzed. The study team contacted the small number of respondents whose results varied significantly from the averages to determine how to deal with the deviation. The analysis of the third round incorporated the results of those discussions.

The overall elapsed time to complete the questionnaire took significantly longer than expected because of the difficulty in finding appropriate experienced individuals with the time and ability to complete the lengthy questionnaire. See Exhibit 1 for summary of survey participants by region. Note that the participants included managers from public housing, non-profit housing and the private sector. See Appendix A for the first round questionnaire. See Appendix B for the second round questionnaire.

EXHIBIT 1—DELPHI SURVEY PARTICIPANTS BY LOCATION

BC	7
Alberta	4
Manitoba	2
Ontario	29
Quebec	9
Nova Scotia	3
Total	54

4.2 PRESENT VALUE AND BUILDING ELEMENT LIFE SPAN

To illustrate the cost implications of the life span of the building elements, the study team called on Helyar and Associates, Cost Consultants and Quantity Surveyors, to provide a list of recently-completed condominium apartment buildings for which the firm had full quantities information. From the list, the study team selected a 12 storey apartment building with a three-level underground parking garage, having a total of 186 dwelling units. The building had a recreational area and swimming pool, balconies to the dwelling units and consisted of about 26,400 square meters of built area including the parking garage. The total construction cost is estimated to be an average of $99,800 per dwelling unit.

Helyar and Associates estimated the repiacement cost for each of the building elements used in the questionnaire. The consulting team then developed present value figures using the average high and low length of life for building elements. The present value calculation to estimate comparative life cycle

expenditure requirements was based on a 100 year building life cycle with no residual value after year 100; no capital repairs after year 95; a construction inflation rate of 5% per year and a discount rate of 6% (the annual rate that is used to convert future costs to a value in today's dollars – i.e. present value).

4.3 ALTERNATIVE RESERVE FUND REQUIREMENTS

For purposes of illustrating alternative reserve fund requirements, the study team prepared financial analysis using 6 different variables:

- length of service life – high-end, low-end;
- building life span – 100 years as above, and 40 years (no replacements after year 35 and zero residual value);
- construction inflation rate – 3%, 5%.

All scenarios used 6% per annum as the rate for investing surplus reserve fund amounts. It is assumed that during the building service life, investment income from reserve fund surpluses are offset by the capital cost allowance so that no tax is paid on the investment income.

The illustrative reserve fund information was based on those elements that were present in the model building. In all cases the computed annual reserve fund contribution requirement is the figure that results in a zero balance in the reserve fund following the last year of replacements. With respect to picking a precise year for the service life length to do the analysis, we suggest a number in the mid point of the sub-range.

5.0 FINDINGS

5.1 LIFE SPAN OF BUILDING ELEMENTS AND RELATED FACTORS

Appendix C lists the results of the three-stage Delphi survey on building element life span and related factors. The tables were developed by first analyzing the service life range produced by the average high-end and average low-end service life. This range was divided approximately equally into three sub-ranges: below average, average and above average. This enables managers to make a judgement call on what sub-range to use when estimating cash flows and calculating the annual reserve fund contribution needed to maintain buildings. With respect to picking a precise year for the service life length to do the analysis, we suggest a number in the mid point of the sub-range.

For example, the building owner/manager, in selecting the appropriate service life sub-range for each element in his/her building, will consider the most important factors affecting service life as indicated in the service life tables. The owner/manager will evaluate how the building and its elements in question could be affected by the factor(s). If material quality is an important factor in the life span, and the current element is of minimal quality, the owner/manager will select service life in the below average sub-range and deduct the number of years since installation. If the owner/manager wishes to replace that element at the appropriate time with an element of similar quality, then the analysis will continue to use below average service life for that element.

Similarly, if regular maintenance and repairs is a prime factor, and the management plans to maintain a high level of preventive maintenance and make repairs promptly, then the service life could be selected from the above average sub-range.

5.2 COMPARISON WITH OHC LIFE EXPECTANCY TABLES

Of the 232 elements in this study, the Ontario Housing Corporation (OHC) has developed life expectancy tables on 182 of them. Of these, the median service life indicated by experienced managers in this study is higher than the OHC life expectancies for 66% of the elements. A total of 25% of the elements common to both lists have, according to the participants in the subject study, a greater low-end service life than the expectancies shown in the OHC table. See Appendix D for details.

5.3 SENSITIVITY OF ANNUAL RESERVE FUND REQUIREMENTS DUE TO THREE FACTORS

The analysis of annual reserve fund requirements using the model building illustrates the sensitivity of the required cash flow to the following three factors:

- length of useful life of the elements and equipment;
- assumed length of life of the building as a whole;
- rate assumed for construction cost inflation.

Length Of Building Element Life

The annual reserve fund contribution using the building element long life span is only about 40% of that using the short life span for building life of 40 years. The corresponding figure is about 60% if the building life span is assumed to be 100 years. These figures are not affected by the construction inflation rate.

Life Span Of The Building As A Whole

It appears that the longer the assumed life of the building, the higher the annual contribution to the reserve fund must be. For a 40-year building life, assuming a service life for building elements at the low-end, the annual reserve fund contribution would be 60% to 85% of that for a 100-year building life span, depending upon the rate of construction inflation. Assuming a service life for building elements at the high-end, the annual contribution for a 40-year life span building is 42% to 61% of that for a 100-year building, depending on the rate of construction inflation.

Rate Of Construction Cost Inflation

In early years, regardless of the length of life assumed for building elements, the construction inflation rate, or the length of life assumed for the building as a whole, the reserve fund will yield increasing surpluses. At a high rate of construction cost inflation (assuming that the annual contribution of the reserve fund increases by the rate of construction cost inflation) these surpluses build up more rapidly than for a lower rate of construction cost inflation. This is in part due to compounded investments. The analysis illustrates that the annual reserve fund contribution for a 40-year building needs to be 36% higher with a 3% construction inflation rate, as compared to that for a 5% rate. The annual reserve fund amount for a 100-year building needs to be 94% higher for a 3% construction inflation rate as compared to that for

the 5% rate. These amounts do not vary with respect to the low-end or high-end length of service life of the individual elements.

The actual amounts per dwelling unit are summarized in the table below. As a proportion of construction replacement costs, the annual reserve fund amount varies from as low as 0.8% for 5% construction inflation, long length of life of building elements in a 40-year building, to a high of 4.5% for 3% construction inflation, short life building elements in a 100-year building.

Short Building Life, Long Element Life and High Construction Inflation Produce Lowest Annual Contribution Requirement to Reserve Fund

Assumed Building Life Span	Annual Contribution To Reserve Fund Per Unit (1999$)*			
	Low-End (Short) Element Service Life		High-End (Long) Element Service Life	
	3% Construction Inflation	5% Construction Inflation	3% Construction Inflation	5% Construction Inflation
40 Years	$2,673	$1,963	$1,112	$817
100 Years	$4,488	$2,311	$2,615	$1,346

* Assumes surplus reserve fund balance is invested at an interest rate of 6% pa and that interest accumulates within the fund to finance element replacement; annual contributions to the reserve fund are indexed to the rate of construction inflation.

The obvious conclusion is that in setting the reserve fund the building ownership should assume a relatively long building life in order to avoid a situation where at some point after 40 years significant shortfalls in the reserve fund may begin to appear. Also it is clearly worthwhile to ensure that appropriate action is taken with respect to decisions in the design process and in the maintenance of the building to ensure maximum length of life of all building elements.

6.0 USING THE FINDINGS

The findings located in the appendices can be used in a variety of ways. These include:

1. Projecting replacement activities;
2. Projecting cash flow needs (reserve funds); and
3. Computing the annual contribution to maintain an adequate level of reserves for repairs/replacements.

The notes below outline steps that could be taken for both older and new buildings. Exhibit 2, on page 11, describes an example.

6.1 PROJECTING REPLACEMENT ACTIVITIES

It is useful to project replacement activities because:

a) This is a precursor to setting budgets for replacements;

b) It can become apparent that one or more replacements and other building activities may be in conflict with one another (i.e. a given replacement activity may have to be partially or fully redone as a result of other activities scheduled for a relatively short time later); and

c) It is necessary to identify and secure appropriate human resources to manage and funds to implement the replacement process.

For new buildings (in advanced stages of design or recently completed and occupied):

1. Identify the building elements and equipment and find their counterparts on the list in Appendix C.

2. For each element, note the factors affecting durability/service life and make a judgement regarding the length of service life to select within the range indicated in Appendix C.

3. Determine how the particular circumstances of the building will impact on the factors. Based on the unique particulars of the building combined with the factors affecting service life, select the appropriate range of service life (below average, average, above average).

4. Decide how far into the future you wish to project replacement activities. This time horizon may reflect the remaining years to reach a selected building life or it may relate to a specific future disposal date.

5. Using an automated spreadsheet, develop a table of replacement activities by element and extend the table to the selected time horizon.

For an existing building, the same steps apply, but additional effort will be required to estimate the current remaining service life for each element. This will require skilled inspection and/or the historic records of building repairs and replacements. The next immediate replacement date for each element will be a function of its remaining service life. Following that date, use the information in the tables and judgement as to where in the range the replacement cycle should be for each element. Develop the automated spreadsheet to produce the table of replacement activities.

6.2 PROJECTING CASH FLOW NEEDS

Having defined the nature, requirements and timing of replacements of building elements, it is possible to project cash flow needs. From the cash flow, it will be therefore possible to project the annual contribution to the reserve fund that will ensure sufficient funding for replacements to the projected time horizon. The additional steps are:

1. For new buildings, the building element quantities information may be readily available from the quantity surveyor/cost consultant. For older buildings, quantities may have to be taken off by an experienced quantity surveyor.

2. From professional sources identify the costs of replacement for each element.

3. Make assumptions regarding the length of the building service life (i.e. no residual construction value following the end of the building service life), construction inflation rate, and rate of return/borrowing rate for surplus/shortfall reserve funds.

4. Compute the replacement costs in current dollars and inflate those amounts by the construction inflation rate for the appropriate years into the future. All information should be tabulated in an automated spreadsheet.

5. Compute the annual reserve fund contribution amount that, if increased annually by the rate of construction inflation, will result in a zero reserve fund balance at the end of the period when replacements are made (this could be 5 years before the end of the building service life – building elements needing replacing would be repaired so that they are performing to an acceptable standard for the remaining time in that period).

6. The amount of the reserve fund per dwelling unit can be prorated from the above figure using the construction area for each dwelling unit.

Note that alternative life spans for building elements could be used to test the sensitivity on cash flows.

Appendix E provides a demonstration of how cash flows can be generated responding to replacement needs based on service life of building elements. The tables in Appendix E also show how the annual contribution to a reserve fund can be computed given a desired balance in the fund at the end of the analysis period.

A generic reserve fund cash flow model has been prepared as part of this project. You may obtain a copy of the Excel spreadsheet from the following URL address:

ftp://ftp.cmhc-schl.gc.ca/servicelife

7.0 CONCLUSIONS

As knowledge of building element life spans increases, and the need for adequate reserve funds becomes more clearly understood, a significant component of the value of older apartment buildings could be the size of their reserve funds. By estimating the impact of the factor that most affects service life for a given building and management approach, managers can select the service life range that they believe will apply. On this basis, managers can begin to project estimates for cash flow for capital repairs/ replacements. Awareness of funding required is the first step in understanding the effort needed to preserve residential buildings. Maintaining adequate reserve funds will help ensure long useful life for Canadian housing stock, whether the stock is owned and managed privately or publicly.

EXHIBIT 2—EXAMPLE

A condominium corporation has appointed a new management group which wishes to review the adequacy of the current annual contributions to the reserve fund, to ensure that the building will maintain its value long term. The building is 12 years old. The corporation picked 40 years as the desired remaining life span for the building, as the basis for computing reserve fund needs and cash flow. At the end of that time, it is anticipated that the building will be sold and demolished to accommodate a higher and better use on the site.

The building superintendent hires a building condition specialist to assess the building. The building condition specialist identifies the full range of building elements comprising the building and estimates the quantities involved for capital repair/replacement. Two or more adjacent items that must be replaced as a unit are also noted. Replacement costs are then estimated for each element.

The analysis team then estimates the remaining useful life of each public area building element (i.e. excluding in-suite elements such as apartment finishes, kitchen/bathroom fixtures and equipment, apartment lighting, etc.) based on a combination of the original installation date or the most recent replacement date and the current condition of the elements, their original quality and workmanship. The team assumes that with timely preventative maintenance, which the corporation is committed to provide, an above average service life for each element can be attained. A careful check is done on the quality and workmanship of the existing elements to ensure that this is a realistic goal. For each element, a service life in the middle range of the above average range is selected. The quantity of each element is estimated as is the current replacement cost.

The analysis team makes assumptions regarding the construction inflation rate, the average rate of return on surplus reserve fund amounts such as may occur during the analysis period and the discount rate to be used to compute present value.

An automated spreadsheet is then set up incorporating repair/replacement dates, unit costs, quantities, including the next replacement of all existing elements. The calculations are set up on the assumption that to achieve a 40 year life followed by demolition, no major capital repairs or replacements will be made after year 35. During years 36 to 40 sufficient repairs will be made to maintain minimum acceptable building performance, but there will be no replacements at the level of quality that would have been done earlier.

Calculations are made on an annual basis, selecting life span and replacement costs for each element over the 40-year period. The annual current dollars are discounted each year to the beginning of year 1 of the analysis so that a present value is available. By iterative computations, the average annual contribution to reserve fund (inflated each year to recognize construction and inflation) is calculated so that at the end of year 35 the sum of the existing reserve fund and the reserve fund to be created will have reached 0. There will be no reserve fund contributions after year 35.

The table provides cash flow in current dollars each year as well as the estimated annual contribution to the reserve fund to maintain the building.

The condominium corporation may wish to test alternative life spans for the building and/or the length of service life for the elements. On this basis, the corporation can review its requirements for reserve fund contributions and be made aware of imminent cash flow requirements for capital. With this plan, the corporation may decide to reduce the contributions for one or more years if the fund seems to be building up faster than anticipated (less capital replacement than originally estimated is actually required), or may have to increase the amount should capital repairs and replacement occur more frequently/ sooner than expected. Every five years the condominium corporation should review the assumption regarding the length of service life of the building. The analysis can be rerun if that assumption changes.

APPENDIX A

First Round Delphi Questionnaire

SERVICE LIFE OF APARTMENT BUILDING ELEMENTS AND EQUIPMENT

NATIONAL SURVEY

This announcement introduces a Canada-wide study aimed at assisting managers and owners of condominium and rental apartment buildings.

One of the objectives of Canada Mortgage and Housing Corporation (CMHC) is to provide technical information to members of the Canadian Housing industry. CMHC has observed that housing managers and condominium corporations need more **"real life"** information on the length of useful life of many of the building elements and pieces of equipment that make up apartment buildings. This information is important in setting up realistic reserve funds to ensure building owners are able to repair/replace elements as they wear out.

Although theoretical information is available on length of life of building elements, CMHC wishes to get the opinion of building managers and building component manufacturers based on their **actual experience**. CMHC has selected IBI Group, a national firm of Architects, Engineers and Planners, to contact experienced members of the building industry across Canada to collect this information. Initial contacts with IBI Group have confirmed your interest in participating.

Enclosed you will find an introduction to the questionnaire and the questionnaire itself. We anticipate that a total of about 60 to 70 housing managers, building product manufacturers, and product associations will participate.

We appreciate your interest in helping us. If you have any questions, please call Harold Katzin, Director, IBI Group, telephone: 416-596-1930, facsimile: 416-596-0644.

LENGTH OF SERVICE LIFE FOR APARTMENT BUILDING ELEMENTS QUESTIONNAIRE

PURPOSE OF THE SURVEY

Canada Mortgage and Housing Corporation (CMHC) recognizes the need to help apartment building managers and owners get a better understanding of **how long the building elements and equipment can last** before they have to be replaced. Knowing the length of service life helps managers and owners set the yearly contribution for reserve funds which help pay for building element repairs and replacement. IBI Group, a national consulting firm is helping CMHC to develop this information.

WHY WE NEED YOUR HELP

CMHC wishes to get the opinion of senior experienced apartment building managers and technical staff with building product manufacturers. The reason for this is to make sure that the answers are based not on theory but on **experience**. You have been identified as having appropriate experience to contribute to this study.

SCOPE OF STUDY

The survey focuses on elevator apartment buildings - mid-rise and high-rise. The building elements and equipment are those primarily related to the building itself including finishes and equipment in common areas. We are asking you simply to answer from your experience with this type of building.

HOW WE WILL USE YOUR ANSWERS

We are asking you for your opinion on the length of life of building elements in two steps. The first step is filling out the attached questionnaire. Your answers will be averaged in with all the other responses for each building element.

In the second step, we will share the overall averages with you and all other persons who respond. This will be done by sending you a special form customized for you. This form will indicate **your** response to the attached questionnaire and beside it the average of all the responses for that question taken from the other questionnaires. No participants will see the individual responses of the other participants. They will only see the overall averages. On the second questionnaire we will ask you to provide an answer again, taking into account the averages that you see beside your original answer from the first questionnaire. When you see each of the averages you may wish to change your original answer or you may wish to provide exactly the same answer as you did in the first questionnaire.

We will average the answers for the second questionnaire and provide these averages for your information. In some cases, we may follow up with specific participants to get a better understanding of their answer on the second questionnaire. This may be done by means of a brief telephone conversation.

We estimate that the attached questionnaire will take about 30 minutes to fill out. Simply fax the response back to the name and fax number appearing at the bottom of this sheet.

HOW TO FILL OUT THIS QUESTIONNAIRE

Length of Service Life

Filling out this questionnaire means simply remembering your experience with regard to the life span for each of the elements listed. Just give a range to estimate the length of service life. For example, metal casement windows, 14 to 20 years.

If you do not have an opinion, please check the no opinion column.

Factors Affecting Length of Service Life

Also give your opinion as to the **two most important** factors that affect the length of service life for each of the elements. The factors affecting length of service life are listed at the bottom of each page. Each one has a letter which appears opposite the line listing the building element. Simply circle the letters of the two most important factors on the line indicating the building element.

We have suggested 7 different factors affecting the length of service life. The 8th factor is "other". To assist you in selecting the appropriate factors, we provide the following definitions:

A) **Design Details**: the manner in which materials are used, joined, and whether or not certain necessary materials are included in an element that is an assembly of more than one material or is a series of parts.

B) **Quality of Materials**: the degree to which materials can withstand forces that cause deterioration.

C) **Installation and Workmanship**: the way in which contractors and the trades assemble the element and install it in relation to other elements.

D) **Knowledge and Understanding of Building Superintendent/Operator**: the extent to which the knowledge and experience of the person providing the day-to-day management of the building can affect length of service life of the element.

E) **Local Climate/Exposure to Weather**: how important rain, wind, freezing and thawing, sun and snow are in reducing the life of the building element.

F) **Regular Maintenance and Repairs**: the extent to which continuing attention on how the element is performing and treating any problems as they appear can extend the life of the element.

G) **Occupancy Characteristics** (seniors or families): how the activities of senior citizens or families with children can affect the extent of wear and tear and therefore life cycle.

H) **Some Other Factor**: any other reason that would affect the length of life of a building element and which does not fit under the above classifications.

If you have any questions, please call Harold Katzin, IBI Group, telephone: 416-596-1930; fax: 416-596-0644.

We look forward to your participation and learning from your experience.

TABLE 1: BUILDING STRUCTURE

Name: _____ *Organization:* _____

Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	Your Estimate of How Long the Building Element will Last	Please Check If No Opinion	Your Opinion on the 2 Most Important Factors Affecting How Long the Building Part will Last (Ref. List Below)	Please Check If No Opinion
1.1	Foundation Walls	Damp-proofing	____ to ____ years		A B C D E F G H	
1.2		Structural Concrete Failure	____ to ____ years		A B C D E F G H	

TABLE 2: BUILDING EXTERIOR

Ref. No.	Building Element	Material or Equipment Type	Your Estimate of How Long the Building Element will Last	Please Check If No Opinion	Your Opinion on the 2 Most Important Factors Affecting How Long the Building Part will Last (Ref. List Below)	Please Check If No Opinion
2.1	Exterior Walls	Precast Concrete Panels	____ to____ years		A B C D E F G H	
2.2		Brick Veneer	____ to ____ years		A B C D E F G H	
2.3		Curtain Wall	____ to ____ years		A B C D E F G H	
2.4		Stucco	____ to ____ years		A B C D E F G H	
2.5	Balcony Decks	Concrete	____ to ____ years		A B C D E F G H	
2.6		Concrete Topping/Waterproofing	____ to ____ years		A B C D E F G H	
2.7	Balcony Railings	Painted Iron Railings	____ to ____ years		A B C D E F G H	
2.8		Aluminum Railings	____ to ____ years		A B C D E F G H	
2.9		Precast Concrete	____ to ____ years		A B C D E F G H	
2.10		Glass Panels with Steel/Metal	____ to ____ years		A B C D E F G H	
2.11	Windows	Metal Casement	____ to ____ years		A B C D E F G H	
2.12		Metal Double-Hung	____ to ____ years		A B C D E F G H	
2.13		Vinyl Casement	____ to ____ years		A B C D E F G H	
2.14		Vinyl Double-Hung	____ to ____ years		A B C D E F G H	
2.15		Metal Sliding	____ to ____ years		A B C D E F G H	
2.16	Doors (Exterior/Balcony)	Sliding Metal/Glass	____ to ____ years		A B C D E F G H	
2.17		Solid Wood/Composite	____ to ____ years		A B C D E F G H	
2.18	Caulking		____ to ____ years		A B C D E F G H	
2.19	Exposed Flashing	Sheet Metal	____ to ____ years		A B C D E F G H	
2.20		Non-Metallic	____ to ____ years		A B C D E F G H	

Factors Affecting Length of Service Life

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

TABLE 3: BUILDING INTERIOR

Name: _____ *Organization:* _____
Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	Your Estimate of How Long the Building Element will Last	Please Check If No Opinion	Your Opinion on the 2 Most Important Factors Affecting How Long the Building Part will Last (Ref. List Below)	Please Check If No Opinion
3.1	Ceilings: Common Area	Painted Concrete	____ to ____ years		A B C D E F G H	
3.2		Plastered Concrete	____ to ____ years		A B C D E F G H	
3.3		Drywall	____ to ____ years		A B C D E F G H	
3.4	Ceilings: Service Area	Painted Concrete	____ to ____ years		A B C D E F G H	
3.5		Plastered Concrete	____ to ____ years		A B C D E F G H	
3.6		Drywall	____ to ____ years		A B C D E F G H	
3.7	Walls: Common Area	Concrete Block Glazed	____ to ____ years		A B C D E F G H	
3.8		Concrete Block Painted	____ to ____ years		A B C D E F G H	
3.9		Drywall	____ to ____ years		A B C D E F G H	
3.10		Ceramic Tiles	____ to ____ years		A B C D E F G H	
3.11		Stone Veneer	____ to ____ years		A B C D E F G H	
3.12	Walls: Service Area	Concrete Block Glazed	____ to ____ years		A B C D E F G H	
3.13		Concrete Block Painted	____ to ____ years		A B C D E F G H	
3.14		Drywall	____ to ____ years		A B C D E F G H	
3.15	Floors: Common Area	Ceramic Tiles	____ to ____ years		A B C D E F G H	
3.16		Carpeting	____ to ____ years		A B C D E F G H	
3.17		Terrazzo	____ to ____ years		A B C D E F G H	
3.18		Vinyl Tiles	____ to ____ years		A B C D E F G H	
3.19	Floors: Service Area	Concrete	____ to ____ years		A B C D E F G H	
3.20		Vinyl Tile/Linoleum	____ to ____ years		A B C D E F G H	
3.21	Stairway Treads	Concrete	____ to ____ years		A B C D E F G H	
3.22		Metal Pans with Poured Concrete	____ to ____ years		A B C D E F G H	
3.23	Stairway Handrails	Painted Iron	____ to ____ years		A B C D E F G H	
3.24	Doors: Common Area	Hollow Metal/Metal Clad	____ to ____ years		A B C D E F G H	
3.25		Wood/Wood Composite	____ to ____ years		A B C D E F G H	
3.26	Doors: Service Area	Hollow Metal/Metal Clad	____ to ____ years		A B C D E F G H	
3.27	Doors: Units	Wood/Wood Composite	____ to ____ years		A B C D E F G H	
3.28	Plumbing Fixtures	Common Laundry Facilities	____ to ____ years		A B C D E F G H	
3.29		Janitor's Room(s)	____ to ____ years		A B C D E F G H	
3.30	Panic Hardware		____ to ____ years		A B C D E F G H	

Factors Affecting Length of Service Life

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

TABLE 4: ELEVATORS

Name: _____ *Organization:* _____
Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	Your Estimate of How Long the Building Element will Last	Please Check If No Opinion	Your Opinion on the 2 Most Important Factors Affecting How Long the Building Part will Last (Ref. List Below)								Please Check If No Opinion
4.1	Elevator	Hoisting Equipment	____ to ____ years		A	B	C	D	E	F	G	H	
4.2		Motor	____ to ____ years		A	B	C	D	E	F	G	H	
4.3		Electrical Controls/Equipment	____ to ____ years		A	B	C	D	E	F	G	H	
4.4		Cab Structure	____ to ____ years		A	B	C	D	E	F	G	H	
4.5		Interior Finishes of Cab	____ to ____ years		A	B	C	D	E	F	G	H	

TABLE 5: ROOFING

Ref. No.	Building Element	Material or Equipment Type	Your Estimate of How Long the Building Element will Last	Please Check If No Opinion	Your Opinion on the 2 Most Important Factors Affecting How Long the Building Part will Last (Ref. List Below)								Please Check If No Opinion
5.1	Roofs (Conventional)	Modified Bitumen	____ to ____ years		A	B	C	D	E	F	G	H	
5.2		Built-up Roofing (BUR)	____ to ____ years		A	B	C	D	E	F	G	H	
5.3		Single-Ply	____ to ____ years		A	B	C	D	E	F	G	H	
5.4	Roofs (Inverted)	Modified Bitumen	____ to ____ years		A	B	C	D	E	F	G	H	
5.5		Built-up Roofing (BUR)	____ to ____ years		A	B	C	D	E	F	G	H	
5.6		Single-Ply	____ to ____ years		A	B	C	D	E	F	G	H	
5.7	Parapets	Concrete	____ to ____ years		A	B	C	D	E	F	G	H	
5.8	Base & Cap Flashing	Sheet Metal	____ to ____ years		A	B	C	D	E	F	G	H	
5.9		Non-Metallic	____ to ____ years		A	B	C	D	E	F	G	H	
5.10	Landscaped Terrace	Wood Deck	____ to ____ years		A	B	C	D	E	F	G	H	
5.11		Concrete on Raised Floor	____ to ____ years		A	B	C	D	E	F	G	H	

Factors Affecting Length of Service Life

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

TABLE 6: PARKING GARAGE

Name: _____ *Organization:* _____

Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	Your Estimate of How Long the Building Element will Last	Please Check If No Opinion	Your Opinion on the 2 Most Important Factors Affecting How Long the Building Part will Last (Ref. List Below)	Please Check If No Opinion
	ATTACHED / OPEN Parking Garage					
6.1	Deck/Roof	Waterproofing	____ to ____ years		A B C D E F G H	
6.2	Walls	Structural Failure	____ to ____ years		A B C D E F G H	
6.3	Columns	Structural Failure	____ to ____ years		A B C D E F G H	
6.4	Drainage System		____ to ____ years		A B C D E F G H	
6.5	Ramps	Structural Failure	____ to ____ years		A B C D E F G H	
6.6		Snow Melting Electrical Cables	____ to ____ years		A B C D E F G H	
6.7		Glycol Ramp Heating System	____ to ____ years		A B C D E F G H	
6.8	Lighting Fixtures *	Fluorescent	____ to ____ years		A B C D E F G H	
6.9		Incandescent	____ to ____ years		A B C D E F G H	
6.10	Overhead Doors	Aluminum	____ to ____ years		A B C D E F G H	
6.11		Steel	____ to ____ years		A B C D E F G H	
6.12		Hoist System / Controls	____ to ____ years		A B C D E F G H	
6.13	Exterior Doors	Metal/Metal Clad	____ to ____ years		A B C D E F G H	
	UNDERGROUND Parking Garage					
6.14	Walls	Waterproofing	____ to ____ years		A B C D E F G H	
6.15		Structural Failure	____ to ____ years		A B C D E F G H	
6.16	Columns	Structural Failure	____ to ____ years		A B C D E F G H	
6.17	Drainage System		____ to ____ years		A B C D E F G H	
6.18	Ramps	Structural Failure	____ to ____ years		A B C D E F G H	
6.19	Lighting Fixtures *	Fluorescent	____ to ____ years		A B C D E F G H	
6.20		Incandescent	____ to ____ years		A B C D E F G H	
6.21	Overhead Doors	Aluminum	____ to ____ years		A B C D E F G H	
6.22		Steel	____ to ____ years		A B C D E F G H	
6.23		Hoist System / Controls	____ to ____ years		A B C D E F G H	
6.24	Exterior Doors	Metal/Metal Clad	____ to ____ years		A B C D E F G H	
6.25	Ventilation/Exhaust Fan(s)		____ to ____ years		A B C D E F G H	
6.26	Heating System		____ to ____ years		A B C D E F G H	
6.27	CO Control System		____ to ____ years		A B C D E F G H	
6.28	Sprinklers	Dry	____ to ____ years		A B C D E F G H	
6.29		Wet	____ to ____ years		A B C D E F G H	
6.30	Fire Extinguishers		____ to ____ years		A B C D E F G H	
6.31	Fire Hoses		____ to ____ years		A B C D E F G H	

* : Includes Fixture/Ballasts but does not include Tubes/Light Bulbs

Factors Affecting Length of Service Life

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

TABLE 7: ELECTRICAL SYSTEMS

Name: _____ *Organization:* _____
Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	Your Estimate of How Long the Building Element will Last	Please Check If No Opinion	Your Opinion on the 2 Most Important Factors Affecting How Long the Building Part will Last (Ref. List Below)	Please Check If No Opinion
7.1	Transformer Vault		____ to ____ years		A B C D E F G H	
7.2	Main Panel	Circuit Breaker	____ to ____ years		A B C D E F G H	
7.3		Fused Switch	____ to ____ years		A B C D E F G H	
7.4	Intermediate Panel	Circuit Breaker	____ to ____ years		A B C D E F G H	
7.5		Fused Switch	____ to ____ years		A B C D E F G H	
7.6	Transformers	Delta Configuration	____ to ____ years		A B C D E F G H	
7.7		"Y" Configuration	____ to ____ years		A B C D E F G H	
7.8	Suite Panel	Plug Fuse	____ to ____ years		A B C D E F G H	
7.9		Circuit Breaker	____ to ____ years		A B C D E F G H	
7.10	Metering	Bulk	____ to ____ years		A B C D E F G H	
7.11		Individual	____ to ____ years		A B C D E F G H	
7.12	Distribution	Bus Duct	____ to ____ years		A B C D E F G H	
7.13		Cable	____ to ____ years		A B C D E F G H	
7.14	Wiring	Copper	____ to ____ years		A B C D E F G H	
7.15		Aluminum	____ to ____ years		A B C D E F G H	
7.16	Fire Alarm (Updated)	Control/Annuciator Panel	____ to ____ years		A B C D E F G H	
7.17		Pull Stations	____ to ____ years		A B C D E F G H	
7.18	Alarm Devices (Bells, Horns, Speakers)		____ to ____ years		A B C D E F G H	
7.19	Smoke Detector	Battery Powered	____ to ____ years		A B C D E F G H	
7.20		Hard Wired	____ to ____ years		A B C D E F G H	
7.21	Heat Detector		____ to ____ years		A B C D E F G H	
7.22	Emergency Power	Battery	____ to ____ years		A B C D E F G H	
7.23		Generator - Diesel	____ to ____ years		A B C D E F G H	
7.24		Generator - Gas	____ to ____ years		A B C D E F G H	
7.25	Building Entry System	Intercom System	____ to ____ years		A B C D E F G H	
7.26	Panel Connected to Telephone System		____ to ____ years		A B C D E F G H	
7.28	Entry Security System	Card Reader System	____ to ____ years		A B C D E F G H	
7.29	Closed Circuit Camera System		____ to ____ years		A B C D E F G H	
7.30	Television	Master Antenna	____ to ____ years		A B C D E F G H	
7.31		Cable	____ to ____ years		A B C D E F G H	
7.32		Satellite Dish	____ to ____ years		A B C D E F G H	
7.33	Lighting Fixtures		____ to ____ years		A B C D E F G H	
7.34	Common Area	24-Hr. Oper.: Fluorescent	____ to ____ years		A B C D E F G H	
7.35		24-Hr. Oper:. Incandescent	____ to ____ years		A B C D E F G H	
7.36	Non-24 Hr. Oper.: Fluorescent		____ to ____ years		A B C D E F G H	
7.37	Non-24 Hr. Oper.: Incandescent		____ to ____ years		A B C D E F G H	
7.38	Service Area	24-Hr. Oper.: Fluorescent	____ to ____ years		A B C D E F G H	
7.39		24-Hr. Oper:. Incandescent	____ to ____ years		A B C D E F G H	
7.40	Non-24 Hr. Oper.: Fluorescent		____ to ____ years		A B C D E F G H	
7.41	Non-24 Hr. Oper.: Incandescent		____ to ____ years		A B C D E F G H	
7.42	Exterior	Fluorescent	____ to ____ years		A B C D E F G H	
7.43		Incandescent	____ to ____ years		A B C D E F G H	
7.44	High Intensity Discharge (HID)		____ to ____ years		A B C D E F G H	

Factors Affecting Length of Service Life

A = Design Details
B = Quality of Equipment/System
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

TABLE 8: MECHANICAL SYSTEMS

Name: _____ *Organization:* _____
Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	Your Estimate of How Long the Building Element will Last	Please Check If No Opinion	Your Opinion on the 2 Most Important Factors Affecting How Long the Building Part will Last (Ref. List Below)	Please Check If No Opinion
8.1	Heating System Using:	Oil	____ to ____ years		A B C D E F G H	
8.2		Gas	____ to ____ years		A B C D E F G H	
8.3		Electric	____ to ____ years		A B C D E F G H	
8.4	Central System	Hot Water	____ to ____ years		A B C D E F G H	
8.5		Water Heat Pump	____ to ____ years		A B C D E F G H	
8.6		Steam	____ to ____ years		A B C D E F G H	
8.7		Central Chiller	____ to ____ years		A B C D E F G H	
8.8	Heating in Suite	Radiation - Electric	____ to ____ years		A B C D E F G H	
8.9		Radiation - Hydronic	____ to ____ years		A B C D E F G H	
8.10		Fan Coil - Electric	____ to ____ years		A B C D E F G H	
8.11		Fan Coil - Hydronic	____ to ____ years		A B C D E F G H	
8.12		Air to Air Heat Pump	____ to ____ years		A B C D E F G H	
8.13		Incremental Unit	____ to ____ years		A B C D E F G H	
8.14		Individual Controls	____ to ____ years		A B C D E F G H	
8.15	Cooling	Centrifugal Chiller	____ to ____ years		A B C D E F G H	
8.16		Absorption Chiller	____ to ____ years		A B C D E F G H	
8.17		Open Loop Cooling Tower	____ to ____ years		A B C D E F G H	
8.18		Closed Loop Cooling Tower	____ to ____ years		A B C D E F G H	
8.19		Roof Mounted Air Cooled Water Chiller	____ to ____ years		A B C D E F G H	
8.20	Pipe Distribution	Pumps	____ to ____ years		A B C D E F G H	
8.21	(Heating/Cooling Syst.)	Chemical Treatment	____ to ____ years		A B C D E F G H	
8.22		Controls	____ to ____ years		A B C D E F G H	
8.23		Valves	____ to ____ years		A B C D E F G H	
8.24		Pipes	____ to ____ years		A B C D E F G H	
8.25		Insulation	____ to ____ years		A B C D E F G H	
8.26	Corridor Air Make Up	Fan Only	____ to ____ years		A B C D E F G H	
8.27		Built-Up Unit (BUU)- Heated: Gas-Fired Unit	____ to ____ years		A B C D E F G H	
8.28		BUU - Heated: Glycol Coil	____ to ____ years		A B C D E F G H	
8.29		BUU - Heated: Hot Water Coil	____ to ____ years		A B C D E F G H	
8.30		BUU - Cooled: Direct Expansion System	____ to ____ years		A B C D E F G H	
8.31		BUU - Cooled: Chilled Water Coil	____ to ____ years		A B C D E F G H	
8.32		BUU - Cooled: Other	____ to ____ years		A B C D E F G H	
8.33		Roof Top Combined Unit (RTCU)-Heated:Gas-Fired Unit	____ to ____ years		A B C D E F G H	
8.34		RTCU - Heated: Glycol Coil	____ to ____ years		A B C D E F G H	
8.35		RTCU - Heated: Hot Water Coil	____ to ____ years		A B C D E F G H	
8.36		RTCU - Cooled: Direct Expansion System	____ to ____ years		A B C D E F G H	
8.37		RTCU - Cooled: Chilled Water Coil	____ to ____ years		A B C D E F G H	
8.38		RTCU - Cooled: Other	____ to ____ years		A B C D E F G H	
8.39	Roof Top Exhaust Fans	Central Duct System	____ to ____ years		A B C D E F G H	
8.40		In-Suite Bathroom Fan(s)	____ to ____ years		A B C D E F G H	
8.41		In-Suite Kitchen Fan(s)	____ to ____ years		A B C D E F G H	

Factors Affecting Length of Service Life

A = Design Details
B = Quality of Equipment/System
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

TABLE 8 (Continued): MECHANICAL SYSTEMS

Ref. No.	Building Element	Material or Equipment Type	Your Estimate of How Long the Building Element will Last	Please Check If No Opinion	Your Opinion on the 2 Most Important Factors Affecting How Long the Building Part will Last (Ref. List Below)	Please Check If No Opinion
8.42	Domestic Cold Water	Booster Pump	___ to ___ years		A B C D E F G H	
8.43		Meter	___ to ___ years		A B C D E F G H	
8.44		Copper Pipes	___ to ___ years		A B C D E F G H	
8.45		Galvanized Pipes	___ to ___ years		A B C D E F G H	
8.46		PVC Pipes	___ to ___ years		A B C D E F G H	
8.47		Suite Shut Off	___ to ___ years		A B C D E F G H	
8.48		Riser Shut Off	___ to ___ years		A B C D E F G H	
8.49	Domestic Hot Water	Central Oil	___ to ___ years		A B C D E F G H	
8.50		Central Gas	___ to ___ years		A B C D E F G H	
8.51		Central Electric	___ to ___ years		A B C D E F G H	
8.52		In-Suite Oil	___ to ___ years		A B C D E F G H	
8.53		In-Suite Gas	___ to ___ years		A B C D E F G H	
8.54		In-Suite Electric	___ to ___ years		A B C D E F G H	
8.55		Central Tank Lining	___ to ___ years		A B C D E F G H	
8.56		Central Tank Sterilization	___ to ___ years		A B C D E F G H	
8.57		Suite Shut Off	___ to ___ years		A B C D E F G H	
8.58		Riser Shut Off	___ to ___ years		A B C D E F G H	
8.59		Recirculating System	___ to ___ years		A B C D E F G H	
8.60	Sprinkler	Pumps	___ to ___ years		A B C D E F G H	
8.61		Dry Valves	___ to ___ years		A B C D E F G H	
8.62		Wet Valves	___ to ___ years		A B C D E F G H	
8.63		Valve Control Devices	___ to ___ years		A B C D E F G H	
8.64		Sprinkler Heads	___ to ___ years		A B C D E F G H	
8.65		Pipes	___ to ___ years		A B C D E F G H	
8.66	Fire Hose Cabinets	Access Doors	___ to ___ years		A B C D E F G H	
8.67		Hose	___ to ___ years		A B C D E F G H	
8.68		Fire Extinguishers	___ to ___ years		A B C D E F G H	
8.69		Valves/Hoses' Nozzles	___ to ___ years		A B C D E F G H	
8.70	Sanitary Sewer	Cast Iron	___ to ___ years		A B C D E F G H	
8.71		Copper	___ to ___ years		A B C D E F G H	
8.72		Aluminum	___ to ___ years		A B C D E F G H	
8.73		PVC	___ to ___ years		A B C D E F G H	
8.74	Storm Sewer	Concrete Transite Pipe	___ to ___ years		A B C D E F G H	
8.75		Cast Iron Pipe	___ to ___ years		A B C D E F G H	
8.76		Area/Roof Drains - Full Flow	___ to ___ years		A B C D E F G H	
8.77		Area/Roof Drains - Control Flow	___ to ___ years		A B C D E F G H	
8.78		Catch Basins	___ to ___ years		A B C D E F G H	
8.79	Garbage Chute	Aluminum	___ to ___ years		A B C D E F G H	
8.80	(UL Rated)	Stainless Steel	___ to ___ years		A B C D E F G H	
8.81		Welded	___ to ___ years		A B C D E F G H	
8.82		Riveted	___ to ___ years		A B C D E F G H	
8.83		Self Latching Doors	___ to ___ years		A B C D E F G H	
8.84		Self Closing Doors	___ to ___ years		A B C D E F G H	
8.85		Fire Rated Doors	___ to ___ years		A B C D E F G H	
8.86	Compactor		___ to ___ years		A B C D E F G H	

Factors Affecting Length of Service Life

A = Design Details
B = Quality of Equipment/System
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

TABLE 9: SWIMMING POOLS

Name: _____ *Organization:* _____
Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	Your Estimate of How Long the Building Element will Last	Please Check If No Opinion	Your Opinion on the 2 Most Important Factors Affecting How Long the Building Part will Last (Ref. List Below)	Please Check If No Opinion
9.1	Swimming Pools	Filtration System	____ to ____ years		A B C D E F G H	
9.2		Pool Deterioration due to Moisture	____ to ____ years		A B C D E F G H	
9.3		Major Cracking/Leakage	____ to ____ years		A B C D E F G H	
9.4		Water Supply/Drainage System	____ to ____ years		A B C D E F G H	

Factors Affecting Length of Service Life

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

APPENDIX B

Second Round Delphi Questionnaire

Durability and Service Life of Multi-Unit Highrise Residential Building Components, Elements and Equipment

RESULTS TABLES (SECOND ROUND)

TABLE 1: BUILDING STRUCTURE

Name: _____ *Organization:* _____

Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	YOUR Estimate of How Long the Building Element will Last (Yrs.)	AVERAGE Estimate from Survey of How Long the Building Element will Last (Yrs.)	REVISE Your Estimate in Spaces Below If You Wish (Yrs.) *If NO Change Mark /*	The 2 Most Important Factors Affecting How Long the Building Element will Last *If NO Change Mark /*			
						Your Opinion	*Top 2 Choices from Survey*		*REVISED OPINION*
1.1	Foundation Walls	Damp-proofing	to	24 to 30	to		B	C	
1.2		Structural Concrete Failure	to	30 to 36	to		B	A	

FACTORS AFFECTING LENGTH OF SERVICE LIFE

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

RESULTS TABLES (SECOND ROUND)

TABLE 2: BUILDING EXTERIOR

Name: _____ *Organization:* _____

Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	YOUR Estimate of How Long the Building Element will Last (Yrs.)	AVERAGE Estimate from Survey of How Long the Building Element will Last (Yrs.)	REVISE Your Estimate in Spaces Below If You Wish (Yrs.) *If NO Change Mark /*	The 2 Most Important Factors Affecting How Long the Building Element will Last *If NO Change Mark /*			
						Your Opinion	*Top 2 Choices from Survey*	*REVISED OPINION*	
2.1	Exterior Walls	Precast Concrete Panels	to	38 to 65	to		B A		
2.2		Brick Veneer	to	27 to 45	to		B C		
2.3		Curtain Wall	to	28 to 64	to		B A		
2.4		Stucco	to	17 to 26	to		C B		
2.5	Balcony Decks	Concrete	to	23 to 32	to		B E		
2.6		Concrete Topping/Waterproofing	to	14 to 22	to		E B		
2.7	Balcony Railings	Painted Iron Railings	to	12 to 19	to		B&E F		
2.8		Aluminum Railings	to	23 to 32	to		B E		
2.9		Precast Concrete	to	25 to 34	to		B E		
2.10		Glass Panels with Steel/Metal	to	19 to 27	to		B&E A&C		
2.11	Windows	Metal Casement	to	19 to 29	to		B C&E		
2.12		Metal Double-Hung	to	18 to 27	to		B E		
2.13		Vinyl Casement	to	16 to 24	to		B E		
2.14		Vinyl Double-Hung	to	15 to 23	to		B E		
2.15		Metal Sliding	to	19 to 30	to		B A&E		
2.16	Doors (Exterior/Balcony)	Sliding Metal/Glass	to	18 to 25	to		B F&G		
2.17		Solid Wood/Composite	to	14 to 21	to		B E		
2.18	Caulking		to	9 to 15	to		B C		
2.19	Exposed Flashing	Sheet Metal	to	19 to 29	to		B C		
2.20		Non-Metallic	to	14 to 22	to		B C		

FACTORS AFFECTING LENGTH OF SERVICE LIFE

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

RESULTS TABLES (SECOND ROUND)

TABLE 3: BUILDING INTERIOR

Name: _____ *Organization:* _____

Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	YOUR Estimate of How Long the Building Element will Last (Yrs.)	AVERAGE Estimate from Survey of How Long the Building Element will Last (Yrs.)	REVISE Your Estimate in Spaces Below If You Wish (Yrs.) *If NO Change Mark /*	The 2 Most Important Factors Affecting How Long the Building Element will Last *If NO Change Mark /*		
						Your Opinion	*Top 2 Choices from Survey*	*REVISED OPINION*
3.1	Ceilings: Common Area	Painted Concrete	to	27 to 51	to		B C	
3.2		Plastered Concrete	to	23 to 47	to		F B	
3.3		Drywall	to	18 to 28	to		F&G B	
3.4	Ceilings: Service Area	Painted Concrete	to	28 to 52	to		B F	
3.5		Plastered Concrete	to	25 to 47	to		B C	
3.6		Drywall	to	19 to 28	to		B F&G	
3.7	Walls: Common Area	Concrete Block Glazed	to	31 to 61	to		B G	
3.8		Concrete Block Painted	to	23 to 49	to		F B&G	
3.9		Drywall	to	18 to 27	to		G F	
3.10		Ceramic Tiles	to	16 to 29	to		G B&F	
3.11		Stone Veneer	to	24 to 40	to		B&G C	
3.12	Walls: Service Area	Concrete Block Glazed	to	32 to 60	to		B G	
3.13		Concrete Block Painted	to	24 to 48	to		B G	
3.14		Drywall	to	16 to 25	to		F G	
3.15	Floors: Common Area	Ceramic Tiles	to	17 to 32	to		B&C G	
3.16		Carpeting	to	7 to 12	to		B G	
3.17		Terrazzo	to	26 to 47	to		B C	
3.18		Vinyl Tiles	to	10 to 16	to		B&G F	
3.19	Floors: Service Area	Concrete	to	27 to 53	to		B F	
3.20		Vinyl Tile/Linoleum	to	11 to 18	to		B F	

FACTORS AFFECTING LENGTH OF SERVICE LIFE

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

RESULTS TABLES (SECOND ROUND)

TABLE 3 (Continued): BUILDING INTERIOR

Name: _____ *Organization:* _____

Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	YOUR Estimate of How Long the Building Element will Last (Yrs.)	AVERAGE Estimate from Survey of How Long the Building Element will Last (Yrs.)	REVISE Your Estimate in Spaces Below If You Wish (Yrs.) *If NO Change Mark /*	The 2 Most Important Factors Affecting How Long the Building Element will Last *If NO Change Mark /*			
						Your Opinion	*Top 2 Choices from Survey*		*REVISED OPINION*
3.21	Stairway Treads	Concrete	to	25 to 41	to		B	G	
3.22		Metal Pans with Poured Concrete	to	23 to 38	to		B	C	
3.23	Stairway Handrails	Painted Iron	to	20 to 29	to		G	B	
3.24	Doors: Common Area	Hollow Metal/Metal Clad	to	16 to 27	to		B	G	
3.25		Wood/Wood Composite	to	13 to 22	to		G	B	
3.26	Doors: Service Area	Hollow Metal/Metal Clad	to	16 to 26	to		B	G	
3.27	Doors: Units	Wood/Wood Composite	to	15 to 27	to		B	G	
3.28	Plumbing Fixtures	Common Laundry Facilities	to	12 to 19	to		B	G	
3.29		Janitor's Room(s)	to	15 to 23	to		B	F	
3.30	Panic Hardware		to	10 to 18	to		B	G	

FACTORS AFFECTING LENGTH OF SERVICE LIFE

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

RESULTS TABLES (SECOND ROUND)

TABLE 4: ELEVATORS

Name: _____ *Organization:* _____

Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	YOUR Estimate of How Long the Building Element will Last (Yrs.)	AVERAGE Estimate from Survey of How Long the Building Element will Last (Yrs.)	REVISE Your Estimate in Spaces Below If You Wish (Yrs.) *If NO Change Mark /*	The 2 Most Important Factors Affecting How Long the Building Element will Last *If NO Change Mark /*		
						Your Opinion	*Top 2 Choices from Survey*	*REVISED OPINION*
4.1	Elevator	Hoisting Equipment	to	20 to 32	to		F B	
4.2		Motor	to	16 to 25	to		F B	
4.3		Electrical Controls/Equipment	to	16 to 24	to		F B	
4.4		Cab Structure	to	20 to 31	to		B F	
4.5		Interior Finishes of Cab	to	10 to 19	to		G B	

FACTORS AFFECTING LENGTH OF SERVICE LIFE

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

RESULTS TABLES (SECOND ROUND)

TABLE 5: ROOFING

Name: _____ *Organization:* _____

Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	YOUR Estimate of How Long the Building Element will Last (Yrs.)			AVERAGE Estimate from Survey of How Long the Building Element will Last (Yrs.)			REVISE Your Estimate in Spaces Below If You Wish (Yrs.) *If NO Change Mark /*			The 2 Most Important Factors Affecting How Long the Building Element will Last *If NO Change Mark /*					
												Your Opinion		*Top 2 Choices from Survey*		*REVISED OPINION*	
5.1	Roofs (Conventional)	Modified Bitumen		to		16	to	26		to				C	B&E		
5.2		Built-up Roofing (BUR)		to		16	to	24		to				B	C		
5.3		Single-Ply		to		14	to	22		to				B	C		
5.4	Roofs (Inverted)	Modified Bitumen		to		18	to	27		to				B	A&E		
5.5		Built-up Roofing (BUR)		to		19	to	28		to				C	B		
5.6		Single-Ply		to		16	to	25		to				B	C		
5.7	Parapets	Concrete		to		21	to	33		to				B	C		
5.8	Base & Cap Flashing	Sheet Metal		to		16	to	25		to				C	B		
5.9		Non-Metallic		to		14	to	22		to				C	B		
5.10	Landscaped Terrace	Wood Deck		to		12	to	18		to				B	E		
5.11		Concrete on Raised Floor		to		19	to	29		to				B&E	C		

FACTORS AFFECTING LENGTH OF SERVICE LIFE

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

RESULTS TABLES (SECOND ROUND)

TABLE 6: PARKING GARAGE

Name: _____ *Organization:* _____

Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	YOUR Estimate of How Long the Building Element will Last (Yrs.)	AVERAGE Estimate from Survey of How Long the Building Element will Last (Yrs.)	REVISE Your Estimate in Spaces Below If You Wish (Yrs.) *If NO Change Mark /*	The 2 Most Important Factors Affecting How Long the Building Element will Last *If NO Change Mark /*		
						Your Opinion	*Top 2 Choices from Survey*	*REVISED OPINION*
	ATTACHED / OPEN Parking Garage							
6.1	Deck/Roof	Waterproofing	to	13 to 21	to		B C	
6.2	Walls	Structural Failure	to	25 to 37	to		B E	
6.3	Columns	Structural Failure	to	29 to 38	to		B E	
6.4	Drainage System		to	20 to 31	to		F B	
6.5	Ramps	Structural Failure	to	22 to 32	to		B E	
6.6		Snow Melting Electrical Cables	to	12 to 18	to		B E	
6.7		Glycol Ramp Heating System	to	16 to 17	to		B F	
6.8	Lighting Fixtures *	Fluorescent	to	10 to 20	to		B F	
6.9		Incandescent	to	10 to 20	to		B F	
6.10	Overhead Doors	Aluminum	to	9 to 14	to		F B	
6.11		Steel	to	11 to 18	to		B F	
6.12		Hoist System / Controls	to	7 to 14	to		F B	
6.13	Exterior Doors	Metal/Metal Clad	to	14 to 24	to		B F	

*: Includes Fixture/Ballasts but does not include Tubes/Light Bulbs

FACTORS AFFECTING LENGTH OF SERVICE LIFE

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

RESULTS TABLES (SECOND ROUND)

TABLE 6 (Continued): PARKING GARAGE

Name: _____ *Organization:* _____

Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	YOUR Estimate of How Long the Building Element will Last (Yrs.)			AVERAGE Estimate from Survey of How Long the Building Element will Last (Yrs.)			REVISE Your Estimate in Spaces Below If You Wish (Yrs.) *If NO Change Mark /*			The 2 Most Important Factors Affecting How Long the Building Element will Last *If NO Change Mark /*			
												Your Opinion		*Top 2 Choices from Survey*	*REVISED OPINION*
	UNDERGROUND Parking Garage														
6.14	Walls	Waterproofing		to		19	to	29		to				B C	
6.15		Structural Failure		to		29	to	41		to				B C	
6.16	Columns	Structural Failure		to		28	to	42		to				B A	
6.17	Drainage System			to		21	to	35		to				B F	
6.18	Ramps	Structural Failure		to		23	to	37		to				B A	
6.19	Lighting Fixtures *	Fluorescent		to		11	to	21		to				B F	
6.20		Incandescent		to		11	to	19		to				B F	
6.21	Overhead Doors	Aluminum		to		11	to	16		to				F B	
6.22		Steel		to		13	to	20		to				F B	
6.23		Hoist System / Controls		to		9	to	14		to				F B	
6.24	Exterior Doors	Metal/Metal Clad		to		13	to	24		to				B F	
6.25	Ventilation/Exhaust Fan(s)			to		13	to	22		to				F B	
6.26	Heating System			to		16	to	26		to				F B	
6.27	CO Control System			to		9	to	15		to				F B	
6.28	Sprinklers	Dry		to		17	to	29		to				F B	
6.29		Wet		to		17	to	28		to				F B	
6.30	Fire Extinguishers			to		8	to	17		to				F B	
6.31	Fire Hoses			to		8	to	15		to				F B	

*: Includes Fixture/Ballasts but does not include Tubes/Light Bulbs

FACTORS AFFECTING LENGTH OF SERVICE LIFE

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

RESULTS TABLES (SECOND ROUND)

TABLE 7: ELECTRICAL SYSTEMS

Name: _____ *Organization:* _____

Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	YOUR Estimate of How Long the Building Element will Last (Yrs.)	AVERAGE Estimate from Survey of How Long the Building Element will Last (Yrs.)	REVISE Your Estimate in Spaces Below If You Wish (Yrs.) *If NO Change Mark /*	The 2 Most Important Factors Affecting How Long the Building Element will Last *If NO Change Mark /*		
						Your Opinion	*Top 2 Choices from Survey*	*REVISED OPINION*
7.1	Transformer Vault		to	26 to 38	to		B A	
7.2	Main Panel	Circuit Breaker	to	19 to 32	to		B F	
7.3		Fused Switch	to	19 to 31	to		B F	
7.4	Intermediate Panel	Circuit Breaker	to	18 to 30	to		B F	
7.5		Fused Switch	to	19 to 31	to		B F	
7.6	Transformers	Delta Configuration	to	21 to 27	to		B A&F	
7.7		"Y" Configuration	to	22 to 28	to		A&B F	
7.8	Suite Panel	Plug Fuse	to	16 to 27	to		B F	
7.9		Circuit Breaker	to	18 to 30	to		B F	
7.10	Metering	Bulk	to	24 to 50	to		B F	
7.11		Individual	to	23 to 34	to		B F	
7.12	Distribution	Bus Duct	to	27 to 41	to		B A	
7.13		Cable	to	28 to 41	to		B A	
7.14	Wiring	Copper	to	24 to 41	to		B A	
7.15		Aluminum	to	18 to 40	to		B A	
7.16	Fire Alarm (Updated)	Control/Annuciator Panel	to	14 to 22	to		B F	
7.17		Pull Stations	to	17 to 29	to		B F	
7.18	Alarm Devices (Bells, Horns, Speakers)		to	17 to 26	to		F B	
7.19	Smoke Detector	Battery Powered	to	5 to 10	to		B G	
7.20		Hard Wired	to	10 to 17	to		B F	
7.21	Heat Detector		to	11 to 20	to		B F	

FACTORS AFFECTING LENGTH OF SERVICE LIFE

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

RESULTS TABLES (SECOND ROUND)

TABLE 7 (Continued): ELECTRICAL SYSTEMS

Name: _____ *Organization:* _____

Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	YOUR Estimate of How Long the Building Element will Last (Yrs.)	AVERAGE Estimate from Survey of How Long the Building Element will Last (Yrs.)	REVISE Your Estimate in Spaces Below If You Wish (Yrs.) *If NO Change Mark /*	The 2 Most Important Factors Affecting How Long the Building Element will Last *If NO Change Mark /*		
						Your Opinion	*Top 2 Choices from Survey*	*REVISED OPINION*
7.22	Emergency Power	Battery	to	6 to 10	to		F B	
7.23		Generator - Diesel	to	23 to 35	to		F B	
7.24		Generator - Gas	to	20 to 30	to		F B	
7.25	Building Entry System	Intercom System	to	13 to 21	to		B G	
7.26	Panel Connected to Telephone System		to	15 to 29	to		B A	
7.28	Entry Security System	Card Reader System	to	10 to 17	to		B A&C	
7.29	Closed Circuit Camera System		to	9 to 14	to		B C	
7.30	Television	Master Antenna	to	16 to 21	to		B C&E	
7.31		Cable	to	17 to 24	to		B C	
7.32		Satellite Dish	to	9 to 18	to		B C	
7.33	Lighting Fixtures		to	13 to 22	to		B F	
7.34	Common Area	24-Hr. Oper.: Fluorescent	to	10 to 16	to		B F	
7.35		24-Hr. Oper.. Incandescent	to	10 to 16	to		B F	
7.36	Non-24 Hr. Oper.: Fluorescent		to	10 to 16	to		B F	
7.37	Non-24 Hr. Oper.: Incandescent		to	11 to 17	to		B F	
7.38	Service Area	24-Hr. Oper.: Fluorescent	to	10 to 16	to		B F	
7.39		24-Hr. Oper.. Incandescent	to	11 to 16	to		B F	
7.40	Non-24 Hr. Oper.: Fluorescent		to	11 to 17	to		B F	
7.41	Non-24 Hr. Oper.: Incandescent		to	11 to 15	to		B F	
7.42	Exterior	Fluorescent	to	7 to 11	to		B E	
7.43		Incandescent	to	7 to 11	to		B E	
7.44	High Intensity Discharge (HID)		to	11 to 17	to		B E	

FACTORS AFFECTING LENGTH OF SERVICE LIFE

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

RESULTS TABLES (SECOND ROUND)

TABLE 8: MECHANICAL SYSTEMS

Name: _____ *Organization:* _____

Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	YOUR Estimate of How Long the Building Element will Last (Yrs.)	AVERAGE Estimate from Survey of How Long the Building Element will Last (Yrs.)	REVISE Your Estimate in Spaces Below If You Wish (Yrs.) *If NO Change Mark /*	The 2 Most Important Factors Affecting How Long the Building Element will Last *If NO Change Mark /*		
						Your Opinion	*Top 2 Choices from Survey*	*REVISED OPINION*
8.1	Heating System Using:	Oil	to	19 to 27	to		F B	
8.2		Gas	to	17 to 26	to		F B	
8.3		Electric	to	19 to 29	to		B F	
8.4	Central System	Hot Water	to	21 to 32	to		F B	
8.5		Water Heat Pump	to	11 to 18	to		F B	
8.6		Steam	to	21 to 34	to		F B	
8.7		Central Chiller	to	19 to 28	to		F B	
8.8	Heating in Suite	Radiation - Electric	to	18 to 28	to		B F	
8.9		Radiation - Hydronic	to	22 to 36	to		B F	
8.10		Fan Coil - Electric	to	14 to 23	to		F B	
8.11		Fan Coil - Hydronic	to	16 to 27	to		F B	
8.12		Air to Air Heat Pump	to	11 to 18	to		F B	
8.13		Incremental Unit	to	11 to 19	to		F B	
8.14		Individual Controls	to	11 to 18	to		B F	
8.15	Cooling	Centrifugal Chiller	to	19 to 27	to		F B	
8.16		Absorption Chiller	to	17 to 21	to		B&F A	
8.17		Open Loop Cooling Tower	to	19 to 28	to		F B	
8.18		Closed Loop Cooling Tower	to	19 to 28	to		B&F A&C	
8.19		Roof Mounted Air Cooled Water Chiller	to	15 to 21	to		B&F A	
8.20	Pipe Distribution	Pumps	to	9 to 18	to		B A	
8.21	(Heating/Cooling Syst.)	Chemical Treatment	to	8 to 17	to		F B	
8.22		Controls	to	11 to 19	to		B F	
8.23		Valves	to	11 to 19	to		B F	
8.24		Pipes	to	19 to 32	to		B F	
8.25		Insulation	to	19 to 30	to		B C	

FACTORS AFFECTING LENGTH OF SERVICE LIFE

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

RESULTS TABLES (SECOND ROUND)

TABLE 8 (Continued): MECHANICAL SYSTEMS

Name: _____ *Organization:* _____

Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	YOUR Estimate of How Long the Building Element will Last (Yrs.)	AVERAGE Estimate from Survey of How Long the Building Element will Last (Yrs.)	REVISE Your Estimate in Spaces Below If You Wish (Yrs.) *If NO Change Mark /*	The 2 Most Important Factors Affecting How Long the Building Element will Last *If NO Change Mark /*			
						Your Opinion		*Top 2 Choices from Survey*	*REVISED OPINION*
8.26	Corridor Air Make Up	Fan Only		11 to 19				F B	
8.27		Built-Up Unit (BUU)- Heated: Gas-Fired Unit		15 to 23				F B	
8.28		BUU - Heated: Glycol Coil		16 to 26				B&F A	
8.29		BUU - Heated: Hot Water Coil		16 to 26				B A	
8.30		BUU - Cooled: Direct Expansion System		15 to 25				F B	
8.31		BUU - Cooled: Chilled Water Coil		14 to 21				F B	
8.32		BUU - Cooled: Other		15 to 22				F B	
8.33		Roof Top Combined Unit (RTCU)-Heated:Gas-Fired Unit		16 to 27				B&F E	
8.34		RTCU - Heated: Glycol Coil		18 to 29				H E	
8.35		RTCU - Heated: Hot Water Coil		15 to 25				F B	
8.36		RTCU - Cooled: Direct Expansion System		14 to 24				F B	
8.37		RTCU - Cooled: Chilled Water Coil		17 to 28				F B	
8.38		RTCU - Cooled: Other		13 to 19				F B	
8.39	Roof Top Exhaust Fans	Central Duct System		18 to 28				F B	
8.40		In-Suite Bathroom Fan(s)		11 to 19				F B	
8.41		In-Suite Kitchen Fan(s)		11 to 18				F B	
8.42	Domestic Cold Water	Booster Pump		11 to 19				B F	
8.43		Meter		18 to 26				H A	
8.44		Copper Pipes		25 to 41				B C	
8.45		Galvanized Pipes		20 to 29				B C	
8.46		PVC Pipes		20 to 34				B C	
8.47		Suite Shut Off		15 to 23				B C	
8.48		Riser Shut Off		15 to 26				B C&F	

FACTORS AFFECTING LENGTH OF SERVICE LIFE

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

RESULTS TABLES (SECOND ROUND)

TABLE 8 (Continued): MECHANICAL SYSTEMS

Name: _____ *Organization:* _____

Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	YOUR Estimate of How Long the Building Element will Last (Yrs.)	AVERAGE Estimate from Survey of How Long the Building Element will Last (Yrs.)	REVISE Your Estimate in Spaces Below If You Wish (Yrs.) *If NO Change Mark /*	The 2 Most Important Factors Affecting How Long the Building Element will Last *If NO Change Mark /*		
						Your Opinion	*Top 2 Choices from Survey*	*REVISED OPINION*
8.49	Domestic Hot Water	Central Oil	to	13 to 21	to		F B	
8.50		Central Gas	to	13 to 22	to		B F	
8.51		Central Electric	to	15 to 24	to		H A	
8.52		In-Suite Oil	to	11 to 17	to		B F	
8.53		In-Suite Gas	to	13 to 20	to		B F	
8.54		In-Suite Electric	to	11 to 16	to		H A	
8.55		Central Tank Lining	to	13 to 22	to		B F	
8.56		Central Tank Sterilization	to	7 to 11	to		F B	
8.57		Suite Shut Off	to	14 to 23	to		B F	
8.58		Riser Shut Off	to	15 to 23	to		B F	
8.59		Recirculating System	to	13 to 21	to		B F	
8.60	Sprinkler	Pumps	to	16 to 23	to		F B	
8.61		Dry Valves	to	25 to 48	to		B F	
8.62		Wet Valves	to	24 to 46	to		B F	
8.63		Valve Control Devices	to	13 to 22	to		B F	
8.64		Sprinkler Heads	to	24 to 50	to		B F	
8.65		Pipes	to	19 to 33	to		B A	
8.66	Fire Hose Cabinets	Access Doors	to	22 to 36	to		B F&G	
8.67		Hose	to	10 to 18	to		F B	
8.68		Fire Extinguishers	to	8 to 18	to		B&F A&G	
8.69		Valves/Hoses' Nozzles	to	13 to 27	to		B F	
8.70	Sanitary Sewer	Cast Iron	to	28 to 42	to		B C	
8.71		Copper	to	26 to 40	to		B C	
8.72		Aluminum	to	27 to 36	to		F B/C/E	
8.73		PVC	to	21 to 37	to		C F	

FACTORS AFFECTING LENGTH OF SERVICE LIFE

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

RESULTS TABLES (SECOND ROUND)

TABLE 8 (Continued): MECHANICAL SYSTEMS

Name: _____ *Organization:* _____

Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	YOUR Estimate of How Long the Building Element will Last (Yrs.)			AVERAGE Estimate from Survey of How Long the Building Element will Last (Yrs.)			REVISE Your Estimate in Spaces Below If You Wish (Yrs.) *If NO Change Mark /*			The 2 Most Important Factors Affecting How Long the Building Element will Last *If NO Change Mark /*					
												Your Opinion		*Top 2 Choices from Survey*		*REVISED OPINION*	
8.74	Storm Sewer	Concrete Transite Pipe		to		24	to	39		to				B	E		
8.75		Cast Iron Pipe		to		29	to	45		to				B	C		
8.76		Area/Roof Drains - Full Flow		to		26	to	38		to				E	B		
8.77		Area/Roof Drains - Control Flow		to		24	to	34		to				B&E	F		
8.78		Catch Basins		to		22	to	39		to				B	F		
8.79	Garbage Chute	Aluminum		to		21	to	27		to				B	F		
8.80	(UL Rated)	Stainless Steel		to		22	to	36		to				B	A		
8.81		Welded		to		28	to	44		to				F	B		
8.82		Riveted		to		20	to	47		to				B	F		
8.83		Self Latching Doors		to		9	to	17		to				B/F/G	A		
8.84		Self Closing Doors		to		9	to	16		to				B	G		
8.85		Fire Rated Doors		to		14	to	23		to				B/F/G	H		
8.86	Compactor			to		15	to	25		to				F	A		

FACTORS AFFECTING LENGTH OF SERVICE LIFE

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

RESULTS TABLES (SECOND ROUND)

TABLE 9: SWIMMING POOLS

Name: _____ *Organization:* _____

Phone #: _____ *Fax #:* _____

Ref. No.	Building Element	Material or Equipment Type	YOUR Estimate of How Long the Building Element will Last (Yrs.)	AVERAGE Estimate from Survey of How Long the Building Element will Last (Yrs.)	REVISE Your Estimate in Spaces Below If You Wish (Yrs.) *If NO Change Mark /*	The 2 Most Important Factors Affecting How Long the Building Element will Last *If NO Change Mark /*			
						Your Opinion	*Top 2 Choices from Survey*		*REVISED OPINION*
9.1	Swimming Pools	Filtration System	to	10 to 16	to		F	B	
9.2		Pool Deterioration due to Moisture	to	8 to 12	to		F	E	
9.3		Major Cracking/Leakage	to	15 to 17	to		F	E	
9.4		Water Supply/Drainage System	to	14 to 22	to		F	B	

FACTORS AFFECTING LENGTH OF SERVICE LIFE

A = Design Details
B = Quality of Materials
C = Installation & Workmanship
D = Knowledge & Understanding of Building Superintendent/Operator
E = Local Climate / Exposure to Weather
F = Regular Maintenance & Repair
G = Occupant Characteristics (Seniors/Families)
H = Some Other Factor

APPENDIX C

Service Life Findings From Completed Delphi Survey

Service Life of Multi-Unit Residential Building Elements and Equipment

SUMMARY OF MAIN SURVEY RESULTS

REF. NO.	BUILDING ELEMENT	MATERIAL OR EQUIPMENT TYPE	LENGTH OF SERVICE LIFE			TOP FACTORS AFFECTING LENGTH OF SERVICE LIFE							
			Below Average	Avergage	Above Average	A Design Details	B Quality of Materials	C Install. & Work-manship	D Knowledge of Building Superinten. Operator	E Local Climate/ Weather Exposure	F Regular Mainten. & Repair	G Occupant Character. (Senior/ Families)	H Some Other Factor
	BUILDING STRUCTURE												
1.1	**Foundation Walls**	Damp-proofing	23 to 25	26 to 29	30 to 32		■						
1.2		Structural Concrete Failure	28 to 31	32 to 34	35 to 38		■						
	BUILDING EXTERIOR												
2.1	**Exterior Walls**	Precast Concrete Panels	34 to 38	39 to 44	45 to 49	■	■						
2.2		Brick Veneer	27 to 31	32 to 37	38 to 42		■	■					
2.3		Curtain Wall	26 to 31	32 to 38	39 to 44		■						
2.4		Stucco	17 to 19	20 to 22	23 to 25			■					
2.5	**Balcony Decks**	Concrete	21 to 23	24 to 26	27 to 29		■			■			
2.6		Concrete Topping/Waterproofing	12 to 14	15 to 17	18 to 20		■			■			
2.7	**Balcony Railings**	Painted Iron Railings	11 to 13	14 to 15	16 to 18		■						
2.8		Aluminum Railings	20 to 23	24 to 26	27 to 30		■						
2.9		Precast Concrete	23 to 25	26 to 29	30 to 32		■						
2.10		Glass Panels with Steel/Metal	19 to 21	22 to 24	25 to 27		■			■			
2.11	**Windows**	Metal Casement	19 to 21	22 to 25	26 to 28		■						
2.12		Metal Double-Hung	18 to 20	21 to 23	24 to 26		■						
2.13		Vinyl Casement	15 to 17	18 to 20	21 to 23		■						
2.14		Vinyl Double-Hung	13 to 15	16 to 19	20 to 22		■						
2.15		Metal Sliding	18 to 20	21 to 24	25 to 27		■						
2.16	**Doors (Exterior/Balcony)**	Sliding Metal/Glass	18 to 19	20 to 22	23 to 24		■						
2.17		Solid Wood/Composite	14 to 15	16 to 18	19 to 20		■						
2.18	**Caulking**		8 to 9	10 to 11	12 to 13		■	■					
2.19	**Exposed Flashing**	Sheet Metal	18 to 21	22 to 25	26 to 29		■	■					
2.20		Non-Metallic	13 to 15	16 to 19	20 to 22		■	■					

■ MOST IMPORTANT FACTOR(S) - Factors within 9% of each other are considered to be of equal importance

SECOND MOST IMPORTANT FACTOR(S) - Other factors within, on average, 25% below the 'lowest' of the Most Important Factor(s) and within 8% of each other

Service Life of Multi-Unit Residential Building Elements and Equipment

SUMMARY OF MAIN SURVEY RESULTS

REF. NO.	BUILDING ELEMENT	MATERIAL OR EQUIPMENT TYPE	Below Average	Avergage	Above Average	A Design Details	B Quality of Materials	C Install. & Work-manship	D Knowledge of Building Superinten. Operator	E Local Climate/ Weather Exposure	F Regular Mainten. & Repair	G Occupant Character. (Senior/ Families)	H Some Other Factor
	BUILDING INTERIOR												
3.1	Ceilings: Common Area	Painted Concrete	23 to 27	28 to 31	32 to 36		■	■					
3.2		Plastered Concrete	19 to 22	23 to 26	27 to 30		■				■		
3.3		Drywall	18 to 20	21 to 24	25 to 27		■				■	■	
3.4	Ceilings: Service Area	Painted Concrete	23 to 27	28 to 32	33 to 37		■						
3.5		Plastered Concrete	20 to 23	24 to 27	28 to 31		■						
3.6		Drywall	19 to 21	22 to 24	25 to 27		■						
3.7	Walls: Common Area	Concrete Block Glazed	29 to 33	34 to 39	40 to 44		■						
3.8		Concrete Block Painted	24 to 27	28 to 32	33 to 36		■				■		
3.9		Drywall	18 to 21	22 to 25	26 to 29							■	
3.10		Ceramic Tiles	16 to 19	20 to 23	24 to 27							■	
3.11		Stone Veneer	25 to 30	31 to 35	36 to 41		■	■				■	
3.12	Walls: Service Area	Concrete Block Glazed	29 to 33	34 to 38	39 to 43		■						
3.13		Concrete Block Painted	24 to 28	29 to 32	33 to 37		■					■	
3.14		Drywall	16 to 18	19 to 22	23 to 25							■	
3.15	Floors: Common Area	Ceramic Tiles	17 to 20	21 to 25	26 to 29		■	■					
3.16		Carpeting	7 to 8	9 to 10	11 to 12		■						
3.17		Terrazzo	28 to 34	35 to 40	41 to 47		■						
3.18		Vinyl Tiles	10 to 11	12 to 14	15 to 16		■						
3.19	Floors: Service Area	Concrete	25 to 29	30 to 33	34 to 38		■						
3.20		Vinyl Tile/Linoleum	10 to 12	13 to 14	15 to 17		■						
3.21	Stairway Treads	Concrete	25 to 29	30 to 33	34 to 38		■						
3.22		Metal Pans with Poured Concrete	22 to 25	26 to 29	30 to 33		■						
3.23	Stairway Handrails	Painted Iron	18 to 20	21 to 23	24 to 26		■					■	
3.24	Doors: Common Area	Hollow Metal/Metal Clad	16 to 19	20 to 22	23 to 26		■					■	
3.25		Wood/Wood Composite	12 to 14	15 to 17	18 to 20		■					■	
3.26	Doors: Service Area	Hollow Metal/Metal Clad	15 to 18	19 to 21	22 to 25		■						
3.27	Doors: Units	Wood/Wood Composite	14 to 16	17 to 20	21 to 25		■					■	
3.28	Plumbing Fixtures	Common Laundry Facilities	12 to 14	15 to 16	17 to 19		■					■	
3.29		Janitor's Room(s)	16 to 18	19 to 21	22 to 24		■				■		
3.30	Panic Hardware		11 to 13	14 to 15	16 to 18		■						

■ MOST IMPORTANT FACTOR(S) - Factors within 9% of each other are considered to be of equal importance

SECOND MOST IMPORTANT FACTOR(S) - Other factors within, on average, 25% below the 'lowest' of the Most Important Factor(s) and within 8% of each other

Service Life of Multi-Unit Residential Building Elements and Equipment

SUMMARY OF MAIN SURVEY RESULTS

REF. NO.	BUILDING ELEMENT	MATERIAL OR EQUIPMENT TYPE	Below Average	Avergage	Above Average	A Design Details	B Quality of Materials	C Install. & Work-manship	D Knowledge of Building Superinten. Operator	E Local Climate/ Weather Exposure	F Regular Mainten. & Repair	G Occupant Character. (Senior/ Families)	H Some Other Factor
	ELEVATORS												
4.1	Elevator	Hoisting Equipment	19 to 22	23 to 26	27 to 30						■		
4.2		Motor	15 to 17	18 to 20	21 to 23						■		
4.3		Electrical Controls/Equipment	16 to 18	19 to 21	22 to 24		■						
4.4		Cab Structure	19 to 22	23 to 26	27 to 30								
4.5		Interior Finishes of Cab	10 to 12	13 to 15	16 to 18							■	
	ROOFING												
5.1	Roofs (Conventional)	Modified Bitumen	17 to 20	21 to 23	24 to 27		■	■		■			
5.2		Built-up Roofing (BUR)	16 to 18	19 to 21	22 to 24		■	■					
5.3		Single-Ply	14 to 16	17 to 20	21 to 23		■						
5.4	Roofs (Inverted)	Modified Bitumen	18 to 20	21 to 23	24 to 26	■	■	■					
5.5		Built-up Roofing (BUR)	18 to 20	21 to 24	25 to 27		■	■					
5.6		Single-Ply	16 to 18	19 to 21	22 to 24		■	■					
5.7	Parapets	Concrete	21 to 24	25 to 29	30 to 33		■	■					
5.8	Base & Cap Flashing	Sheet Metal	15 to 17	18 to 21	22 to 24			■					
5.9		Non-Metallic	14 to 16	17 to 18	19 to 21		■	■					
5.10	Landscaped Terrace	Wood Deck	12 to 13	14 to 16	17 to 18		■			■			
5.11		Concrete on Raised Floor	19 to 21	22 to 25	26 to 28								

■ MOST IMPORTANT FACTOR(S) - Factors within 9% of each other are considered to be of equal importance

SECOND MOST IMPORTANT FACTOR(S) - Other factors within, on average, 25% below the 'lowest' of the Most Important Factor(s) and within 8% of each other

SUMMARY OF MAIN SURVEY RESULTS

REF. NO.	BUILDING ELEMENT	MATERIAL OR EQUIPMENT TYPE	Below Average	Average	Above Average	A Design Details	B Quality of Materials	C Install. & Work-manship	D Knowledge of Building Superintem. Operater	E Local Climate/ Weather Exposure	F Regular Mainten. & Repair	G Occupant Character. (Senior/ Families)	H Some Other Factor
	PARKING GARAGE												
	ATTACHED / OPEN Parking Garage												
6.1	Deck/Roof	Waterproofing	13 to 15	16 to 17	18 to 20		■	■					
6.2	Walls	Structural Failure	26 to 30	31 to 34	35 to 39		■						
6.3	Columns	Structural Failure	29 to 32	33 to 36	37 to 40								
6.4	Drainage System		21 to 24	25 to 28	29 to 32						■		
6.5	Ramps	Structural Failure	21 to 24	25 to 28	29 to 32		■						
6.6		Snow Melting Electrical Cable	12 to 13	14 to 16	17 to 18		■						
6.7		Glycol Ramp Heating System	12 to 13	14 to 15	16 to 17		■						
6.8	Lighting Fixtures *	Fluorescent	10 to 13	14 to 16	17 to 20		■						
6.9		Incandescent	10 to 13	14 to 17	18 to 21		■						
6.10	Overhead Doors	Aluminum	9 to 10	11 to 12	13 to 14		■						
6.11		Steel	10 to 12	13 to 15	16 to 18		■						
6.12		Hoist System / Controls	7 to 9	10 to 11	12 to 14						■		
6.13	Exterior Doors	Metal/Metal Clad	13 to 16	17 to 19	20 to 23		■						
	UNDERGROUND Parking Garage												
6.14	Walls	Waterproofing	17 to 21	22 to 25	26 to 30		■	■					
6.15		Structural Failure	30 to 34	35 to 39	40 to 44		■						
6.16	Columns	Structural Failure	28 to 33	34 to 39	40 to 45								
6.17	Drainage System		20 to 24	25 to 30	31 to 35						■		
6.18	Ramps	Structural Failure	23 to 27	28 to 32	33 to 37		■						
6.19	Lighting Fixtures *	Fluorescent	10 to 12	13 to 16	17 to 19		■						
6.20		Incandescent	10 to 12	13 to 15	16 to 18		■						
6.21	Overhead Doors	Aluminum	10 to 11	12 to 14	15 to 16		■						
6.22		Steel	12 to 14	15 to 17	18 to 20		■				■		
6.23		Hoist System / Controls	8 to 9	10 to 12	13 to 14								
6.24	Exterior Doors	Metal/Metal Clad	12 to 15	16 to 19	20 to 23		■						
6.25	Ventilation/Exhaust Fan(s)		12 to 14	15 to 18	19 to 21						■		
6.26	Heating System		14 to 17	18 to 21	22 to 25		■				■		
6.27	CO Control System		10 to 11	12 to 13	14 to 15						■		
6.28	Sprinklers	Dry	17 to 21	22 to 25	26 to 30						■		
6.29		Wet	18 to 21	22 to 26	27 to 30						■		
6.30	Fire Extinguishers		7 to 10	11 to 13	14 to 17						■		
6.31	Fire Hoses		8 to 10	11 to 13	14 to 16		■				■		

■ MOST IMPORTANT FACTOR(S) - Factors within 9% of each other are considered to be of equal importance

■ SECOND MOST IMPORTANT FACTOR(S) - Other factors within, on average, 25% below the 'lowest' of the Most Important Factor(s) and within 8% of each other

SUMMARY OF MAIN SURVEY RESULTS

REF. NO.	BUILDING ELEMENT	MATERIAL OR EQUIPMENT TYPE	Below Average	Average	Above Average	A Design Details	B Quality of Materials	C Install. & Workmanship	D Knowledge of Building Superinten. Operator	E Local Climate/ Weather Exposure	F Regular Mainten. & Repair	G Occupant Character. (Senior/ Families)	H Some Other Factor
	ELECTRICAL SYSTEMS												
7.1	Transformer Vault		25 to 29	30 to 34	35 to 39								
7.2	Main Panel	Circuit Breaker	20 to 25	24 to 27	28 to 31								
7.3		Fused Switch	19 to 22	23 to 25	26 to 29								
7.4	Intermediate Panel	Circuit Breaker	19 to 22	23 to 25	26 to 29								
7.5		Fused Switch	18 to 21	22 to 24	25 to 28								
7.6	Transformers	Delta Configuration	20 to 22	23 to 24	25 to 27								
7.7		"Y" Configuration	20 to 22	23 to 24	25 to 27								
7.8	Suite Panel	Plug Fuse	17 to 20	21 to 24	25 to 28								
7.9		Circuit Breaker	18 to 21	22 to 26	27 to 30								
7.10	Metering	Bulk	25 to 35	36 to 45	46 to 56								
7.11		Individual	24 to 28	29 to 32	33 to 37								
7.12	Distribution	Bus Duct	27 to 31	32 to 36	37 to 41								
7.13		Cable	27 to 31	32 to 37	38 to 42								
7.14	Wiring	Copper	24 to 28	29 to 34	35 to 39								
7.15		Aluminum	19 to 26	27 to 33	34 to 41								
7.16	Fire Alarm (Updated)	Control/Annuciator Panel	15 to 17	18 to 20	21 to 23								
7.17		Pull Stations	16 to 19	20 to 23	24 to 27								
7.18		Alarm Devices (Bells, Horns, Speakers)	15 to 18	19 to 22	23 to 26								
7.19	Smoke Detector	Battery Powered	6 to 7	8 to 9	10 to 11								
7.20		Hard Wired	10 to 12	13 to 15	16 to 18								
7.21	Heat Detector		11 to 13	14 to 16	17 to 19								
7.22	Emergency Power	Battery	6 to 7	8 to 8	9 to 10								
7.23		Generator - Diesel	21 to 24	25 to 28	29 to 32								
7.24		Generator - Gas	19 to 21	22 to 25	26 to 28								
7.25	Building Entry System	Intercom System	13 to 15	16 to 18	19 to 21								
7.26		Panel Connected to Telephone System	16 to 20	21 to 26	27 to 31								
7.28	Entry Security System	Card Reader System	10 to 12	13 to 14	15 to 17								
7.29		Closed Circuit Camera System	9 to 10	11 to 13	14 to 15								
7.30	Television	Master Antenna	14 to 15	16 to 17	18 to 19								
7.31		Cable	17 to 19	20 to 21	22 to 24								
7.32		Satellite Dish	9 to 11	12 to 14	15 to 17								
7.33	Lighting Fixtures		14 to 16	17 to 19	20 to 22								
7.34	Common Area	24-Hr. Oper.: Fluorescent	10 to 11	12 to 14	15 to 16								
7.35		24-Hr. Oper:. Incandescent	11 to 12	13 to 14	15 to 16								
7.36		Non-24 Hr. Oper.: Fluorescent	10 to 11	12 to 14	15 to 16								
7.37		Non-24 Hr. Oper.: Incandescent	11 to 12	13 to 14	15 to 16								
7.38	Service Area	24-Hr. Oper.: Fluorescent	10 to 11	12 to 14	15 to 16								
7.39		24-Hr. Oper:. Incandescent	12 to 13	14 to 15	16 to 17								
7.40		Non-24 Hr. Oper.: Fluorescent	11 to 12	13 to 15	16 to 17								
7.41		Non-24 Hr. Oper.: Incandescent	11 to 12	13 to 14	15 to 16								
7.42	Exterior	Fluorescent	7 to 8	9 to 9	10 to 11								
7.43		Incandescent	7 to 8	9 to 9	10 to 11								
7.44		High Intensity Discharge (HID)	12 to 13	14 to 16	17 to 18								

MOST IMPORTANT FACTOR(S) - Factors within 9% of each other are considered to be of equal importance

SECOND MOST IMPORTANT FACTOR(S) - Other factors within, on average, 25% below the 'lowest' of the Most Important Factor(s) and within 8% of each other

SUMMARY OF MAIN SURVEY RESULTS

REF. NO.	BUILDING ELEMENT	MATERIAL OR EQUIPMENT TYPE	Below Average	Average	Above Average	A Design Details	B Quality of Materials	C Install. & Work-manship	D Knowledge of Building Superinten. Operator	E Local Climate/ Weather Exposure	F Regular Mainten. & Repair	G Occupant Character. (Senior/ Families)	H Some Other Factor
	MECHANICAL SYSTEMS												
8.1	Heating System Using:	Oil	18 to 20	21 to 23	24 to 26								
8.2		Gas	17 to 19	20 to 23	24 to 26								
8.3		Electric	20 to 22	23 to 26	27 to 29								
8.4	Central System	Hot Water	20 to 23	24 to 26	27 to 30								
8.5		Water Heat Pump	11 to 13	14 to 15	16 to 18								
8.6		Steam	21 to 24	25 to 28	29 to 32								
8.7		Central Chiller	19 to 21	22 to 25	26 to 28								
8.8	Heating in Suite	Radiation - Electric	18 to 21	22 to 24	25 to 28								
8.9		Radiation - Hydronic	22 to 25	26 to 28	29 to 32								
8.10		Fan Coil - Electric	14 to 16	17 to 18	19 to 21								
8.11		Fan Coil - Hydronic	15 to 18	19 to 21	22 to 25								
8.12		Air to Air Heat Pump	11 to 12	13 to 15	16 to 17								
8.13		Incremental Unit	11 to 13	14 to 15	16 to 18								
8.14		Individual Controls	11 to 13	14 to 16	17 to 19								
8.15	Cooling	Centrifugal Chiller	19 to 21	22 to 24	25 to 27								
8.16		Absorption Chiller	16 to 16	17 to 18	19 to 19								
8.17		Open Loop Cooling Tower	20 to 22	23 to 25	26 to 28								
8.18		Closed Loop Cooling Tower	20 to 22	23 to 25	26 to 28								
8.19		Roof Mounted Air Cooled Water Chiller	15 to 16	17 to 18	19 to 20								
8.20	Pipe Distribution	Pumps	8 to 10	11 to 14	15 to 17								
8.21	(Heating/Cooling Syst.)	Chemical Treatment	8 to 9	10 to 12	13 to 14								
8.22		Controls	11 to 13	14 to 16	17 to 19								
8.23		Valves	11 to 13	14 to 16	17 to 19								
8.24		Pipes	19 to 23	24 to 27	28 to 32								
8.25		Insulation	18 to 21	22 to 26	27 to 30								
8.26	Corridor Air Make Up	Fan Only	9 to 11	12 to 15	16 to 18								
8.27		Built-Up Unit (BUU)- Heated: Gas-Fired Unit	14 to 16	17 to 19	20 to 22								
8.28		BUU - Heated: Glycol Coil	15 to 17	18 to 19	20 to 22								
8.29		BUU - Heated: Hot Water Coil	16 to 18	19 to 20	21 to 23								
8.30		BUU - Cooled: Direct Expansion System	15 to 17	18 to 20	21 to 23								
8.31		BUU - Cooled: Chilled Water Coil	15 to 17	18 to 19	20 to 22								
8.32		BUU - Cooled: Other	16 to 18	19 to 20	21 to 23								
8.33		Roof Top Combined Unit Heated:Gas-Fired Unit	15 to 17	18 to 19	20 to 22								
8.34		RTCU - Heated: Glycol Coil	14 to 16	17 to 18	19 to 21								
8.35		RTCU - Heated: Hot Water Coil	14 to 15	16 to 18	19 to 20								
8.36		RTCU - Cooled: Direct Expansion System	14 to 15	16 to 18	19 to 20								
8.37		RTCU - Cooled: Chilled Water Coil	14 to 16	17 to 18	19 to 21								
8.38		RTCU - Cooled: Other	14 to 15	16 to 17	18 to 19								
8.39	Roof Top Exhaust Fans	Central Duct System	16 to 18	19 to 21	22 to 24								
8.40		In-Suite Bathroom Fan(s)	11 to 13	14 to 16	17 to 19								
8.41		In-Suite Kitchen Fan(s)	11 to 13	14 to 15	16 to 18								

MOST IMPORTANT FACTOR(S) - Factors within 9% of each other are considered to be of equal importance

SECOND MOST IMPORTANT FACTOR(S) - Other factors within, on average, 25% below the 'lowest' of the Most Important Factor(s) and within 8% of each other

SUMMARY OF MAIN SURVEY RESULTS

REF. NO.	BUILDING ELEMENT	MATERIAL OR EQUIPMENT TYPE	Below Average	Avergage	Above Average	A Design Details	B Quality of Materials	C Install. & Work-manship	D Knowledge of Building Superinten. Operator	E Local Climate/ Weather Exposure	F Regular Mainten. & Repair	G Occupant Character. (Senior/ Families)	H Some Other Factor
	MECHANICAL SYSTEMS	(Continued)											
8.42	Domestic Cold Water	Booster Pump	12 to 14	15 to 16	17 to 19		■				■		
8.43		Meter	17 to 20	21 to 24	25 to 28		■						
8.44		Copper Pipes	25 to 29	30 to 33	34 to 38		■						
8.45		Galvanized Pipes	19 to 22	23 to 25	26 to 29		■						
8.46		PVC Pipes	21 to 24	25 to 29	30 to 33		■						
8.47		Suite Shut Off	14 to 16	17 to 20	21 to 23		■						
8.48		Riser Shut Off	14 to 17	18 to 21	22 to 25		■						
8.49	Domestic Hot Water	Central Oil	12 to 13	14 to 16	17 to 18						■		
8.50		Central Gas	13 to 15	16 to 18	19 to 21		■						
8.51		Central Electric	15 to 17	18 to 20	21 to 23		■				■		
8.52		In-Suite Oil	10 to 11	12 to 13	14 to 15		■				■		
8.53		In-Suite Gas	12 to 14	15 to 16	17 to 19		■				■		
8.54		In-Suite Electric	10 to 11	12 to 13	14 to 15		■						
8.55		Central Tank Lining	12 to 14	15 to 18	19 to 21		■						
8.56		Central Tank Sterilization	5 to 6	7 to 7	8 to 9						■		
8.57		Suite Shut Off	14 to 16	17 to 19	20 to 22		■						
8.58		Riser Shut Off	14 to 16	17 to 19	20 to 22		■						
8.59		Recirculating System	14 to 16	17 to 18	19 to 21		■				■		
8.60	Sprinkler	Pumps	16 to 18	19 to 21	22 to 24		■						
8.61		Dry Valves	18 to 22	23 to 27	28 to 32		■						
8.62		Wet Valves	19 to 23	24 to 27	28 to 32		■						
8.63		Valve Control Devices	14 to 16	17 to 18	19 to 21		■						
8.64		Sprinkler Heads	20 to 24	25 to 29	30 to 34		■						
8.65		Pipes	19 to 23	24 to 27	28 to 32		■						
8.66	Fire Hose Cabinets	Access Doors	22 to 25	26 to 28	29 to 32		■						
8.67		Hose	10 to 12	13 to 15	16 to 18		■				■		
8.68		Fire Extinguishers	8 to 10	11 to 14	15 to 17		■				■		
8.69		Valves/Hoses/Nozzles	13 to 15	16 to 19	20 to 22		■						
8.70	Sanitary Sewer	Cast Iron	27 to 31	32 to 37	38 to 42		■	■					
8.71		Copper	26 to 30	31 to 35	36 to 40		■						
8.72		Aluminum	27 to 30	31 to 34	35 to 38		■				■		
8.73		PVC	21 to 25	26 to 30	31 to 35			■					
8.74	Storm Sewer	Concrete Transite Pipe	24 to 28	29 to 32	33 to 37		■						
8.75		Cast Iron Pipe	28 to 33	34 to 39	40 to 45		■						
8.76		Area/Roof Drains - Full Flow	24 to 27	28 to 32	33 to 36		■			■			
8.77		Area/Roof Drains - Control Flow	24 to 27	28 to 31	32 to 35		■						
8.78		Catch Basins	22 to 26	27 to 32	33 to 37		■				■		
8.79	Garbage Chute	Aluminum	20 to 22	23 to 24	25 to 27		■						
8.80	(UL Rated)	Stainless Steel	21 to 24	25 to 28	29 to 32		■						
8.81		Welded	26 to 29	30 to 34	35 to 38		■				■		
8.82		Riveted	19 to 28	29 to 38	39 to 48		■				■		
8.83		Self Latching Doors	8 to 10	11 to 13	14 to 16		■				■	■	
8.84		Self Closing Doors	8 to 10	11 to 12	13 to 15		■					■	
8.85		Fire Rated Doors	12 to 14	15 to 17	18 to 20		■					■	
8.86	Compactor		14 to 16	17 to 19	20 to 22						■		

■ MOST IMPORTANT FACTOR(S) - Factors within 9% of each other are considered to be of equal importance

□ SECOND MOST IMPORTANT FACTOR(S) - Other factors within, on average, 25% below the 'lowest' of the Most Important Factor(s) and within 8% of each other

Service Life of Multi-Unit Residential Building Elements and Equipment

SUMMARY OF MAIN SURVEY RESULTS

REF. NO.	BUILDING ELEMENT	MATERIAL OR EQUIPMENT TYPE	Below Average	Avergage	Above Average	A Design Details	B Quality of Materials	C Install. & Work-manship	D Knowledge of Building Superinten. Operator	E Local Climate/ Weather Exposure	F Regular Mainten. & Repair	G Occupant Character. (Senior/ Families)	H Some Other Factor
	SWIMMING POOLS												
9.1	Swimming Pools	Filtration System	10 to 11	12 to 14	15 to 16						■		
9.2		Pool Deterioration due to Moisture	8 to 9	10 to 10	11 to 12					■	■		
9.3		Major Cracking/Leakage	11 to 12	13 to 14	15 to 16					■	■		
9.4		Water Supply/Drainage System	14 to 16	17 to 19	20 to 22						■		

■ MOST IMPORTANT FACTOR(S) - Factors within 9% of each other are considered to be of equal importance

SECOND MOST IMPORTANT FACTOR(S) - Other factors within, on average, 25% below the 'lowest' of the Most Important Factor(s) and within 8% of each other

APPENDIX D

Service Life Findings Compared With Element Life Expectancies From Ontario Housing Corporation

COMPARISON OF MAIN SURVEY RESULTS TO ONTARIO HOUSING CORPORATION LIFE EXPECTANCY GUIDELINES

Ref. No.	Building Element	Material or Equipment Type	Service Life Low End Average (Yrs.)	Service Life High End Average (Yrs.)	Median Service Life (L+H)/2 (Yrs.)	Ontario Housing Corporation Life Expectancy* (Yrs.)
	BUILDING STRUCTURE					
1.1	**Foundation Walls**	Damp-proofing	23	32	28	n/a
1.2		Structural Concrete Failure	28	38	33	n/a
	BUILDING EXTERIOR					
2.1	**Exterior Walls**	Precast Concrete Panels	34	49	42	n/a
2.2		Brick Veneer	27	42	35	20
2.3		Curtain Wall	26	44	35	25
2.4		Stucco	17	25	21	20
2.5	**Balcony Decks**	Concrete	21	29	25	n/a
2.6		Concrete Topping/Waterproofing	12	20	16	n/a
2.7	**Balcony Railings**	Painted Iron Railings	11	18	15	15
2.8		Aluminum Railings	20	30	25	15
2.9		Precast Concrete	23	32	28	n/a
2.10		Glass Panels with Steel/Metal	19	27	23	n/a
2.11	**Windows**	Metal Casement	19	28	24	15 (general)
2.12		Metal Double-Hung	18	26	22	15 (general)
2.13		Vinyl Casement	15	23	19	15 (general)
2.14		Vinyl Double-Hung	13	22	18	15 (general)
2.15		Metal Sliding	18	27	23	15 (general)
2.16	**Doors (Exterior/Balcony)**	Sliding Metal/Glass	18	24	21	20
2.17		Solid Wood/Composite	14	20	17	20
2.18	**Caulking**		8	13	11	10
2.19	**Exposed Flashing**	Sheet Metal	18	29	24	10 to 25
2.20		Non-Metallic	13	22	18	15 to 25

* The information below is dated February 29, 1996. It is accompanied by this note: "The following life expectancy information is intended to be used as a guide only and is considered to be representative of the average useful life of building elements under normal operating conditions. It is not a substitute for informed decision making based on element specific information; the actual life span of any building element may vary considerably depending on the service conditions it is subjected to, the design, the quality of materials used, the quality of installation, the environment and the level of applied maintenance".

COMPARISON OF MAIN SURVEY RESULTS TO ONTARIO HOUSING CORPORATION LIFE EXPECTANCY GUIDELINES

Ref. No.	Building Element	Material or Equipment Type	Service Life Low End Average (Yrs.)	Service Life High End Average (Yrs.)	Median Service Life (L+H)/2 (Yrs.)	Ontario Housing Corporation Life Expectancy* (Yrs.)
	BUILDING INTERIOR					
3.1	**Ceilings: Common Area**	Painted Concrete	23	36	30	n/a
3.2		Plastered Concrete	19	30	25	n/a
3.3		Drywall	18	27	23	20
3.4	**Ceilings: Service Area**	Painted Concrete	23	37	30	n/a
3.5		Plastered Concrete	20	31	26	n/a
3.6		Drywall	19	27	23	20
3.7	**Walls: Common Area**	Concrete Block Glazed	29	44	37	n/a
3.8		Concrete Block Painted	24	36	30	n/a
3.9		Drywall	18	29	24	15
3.10		Ceramic Tiles	16	27	22	n/a
3.11		Stone Veneer	25	41	33	n/a
3.12	**Walls: Service Area**	Concrete Block Glazed	29	43	36	n/a
3.13		Concrete Block Painted	24	37	31	n/a
3.14		Drywall	16	25	21	15
3.15	**Floors: Common Area**	Ceramic Tiles	17	29	23	20
3.16		Carpeting	7	12	10	10
3.17		Terrazzo	28	47	38	n/a
3.18		Vinyl Tiles	10	16	13	10
3.19	**Floors: Service Area**	Concrete	25	38	32	n/a
3.20		Vinyl Tile/Linoleum	10	17	14	10
3.21	**Stairway Treads**	Concrete	25	38	32	n/a
3.22		Metal Pans with Poured Concrete	22	33	28	n/a
3.23	**Stairway Handrails**	Painted Iron	18	26	22	n/a
3.24	**Doors: Common Area**	Hollow Metal/Metal Clad	16	26	21	15
3.25		Wood/Wood Composite	12	20	16	15
3.26	**Doors: Service Area**	Hollow Metal/Metal Clad	15	25	20	15
3.27	**Doors: Units**	Wood/Wood Composite	14	23	19	15
3.28	**Plumbing Fixtures**	Common Laundry Facilities	12	19	16	10 to 20
3.29		Janitor's Room(s)	16	24	20	10 to 20
3.30	**Panic Hardware**		11	18	15	15

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COMPARISON OF MAIN SURVEY RESULTS TO ONTARIO HOUSING CORPORATION LIFE EXPECTANCY GUIDELINES

Ref. No.	Building Element	Material or Equipment Type	Service Life Low End Average (Yrs.)	Service Life High End Average (Yrs.)	Median Service Life (L+H)/2 (Yrs.)	Ontario Housing Corporation Life Expectancy* (Yrs.)
	ELEVATORS					
4.1	**Elevator**	Hoisting Equipment	19	30	25	20
4.2		Motor	15	23	19	20
4.3		Electrical Controls/Equipment	16	24	20	15
4.4		Cab Structure	19	30	25	n/a
4.5		Interior Finishes of Cab	10	18	14	15
	ROOFING					
5.1	**Roofs (Conventional)**	Modified Bitumen	17	27	22	15
5.2		Built-up Roofing (BUR)	16	24	20	15
5.3		Single-Ply	14	23	19	20
5.4	**Roofs (Inverted)**	Modified Bitumen	18	26	22	20
5.5		Built-up Roofing (BUR)	18	27	23	15 to 20
5.6		Single-Ply	16	24	20	20
5.7	**Parapets**	Concrete	21	33	27	n/a
5.8	**Base & Cap Flashing**	Sheet Metal	15	24	20	25
5.9		Non-Metallic	14	21	18	15 to 25
5.10	**Landscaped Terrace**	Wood Deck	12	18	15	10
5.11		Concrete on Raised Floor	19	28	24	15

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COMPARISON OF MAIN SURVEY RESULTS TO ONTARIO HOUSING CORPORATION LIFE EXPECTANCY GUIDELINES

Ref. No.	Building Element	Material or Equipment Type	Service Life Low End Average (Yrs.)	Service Life High End Average (Yrs.)	Median Service Life (L+H)/2 (Yrs.)	Ontario Housing Corporation Life Expectancy* (Yrs.)
	PARKING GARAGE					
	ATTACHED / OPEN Parking Garage					
6.1	Deck/Roof	Waterproofing	13	20	17	15
6.2	Walls	Structural Failure	26	39	33	n/a
6.3	Columns	Structural Failure	29	40	35	n/a
6.4	Drainage System		21	32	27	25
6.5	Ramps	Structural Failure	21	32	27	10 (repairs)
6.6		Snow Melting Electrical Cables	12	18	15	10
6.7		Glycol Ramp Heating System	12	17	15	n/a
6.8	Lighting Fixtures *	Fluorescent	10	20	15	15
6.9		Incandescent	10	21	16	15
6.10	Overhead Doors	Aluminum	9	14	12	10
6.11		Steel	10	18	14	10
6.12		Hoist System / Controls	7	14	11	10
6.13	Exterior Doors	Metal/Metal Clad	13	23	18	20
	UNDERGROUND Parking Garage					
6.14	Walls	Waterproofing	17	30	24	15
6.15		Structural Failure	30	44	37	n/a
6.16	Columns	Structural Failure	28	45	37	n/a
6.17	Drainage System		20	35	28	25
6.18	Ramps	Structural Failure	23	37	30	10 (repairs)
6.19	Lighting Fixtures *	Fluorescent	10	19	15	15
6.20		Incandescent	10	18	14	15
6.21	Overhead Doors	Aluminum	10	16	13	10
6.22		Steel	12	20	16	10
6.23		Hoist System / Controls	8	14	11	10
6.24	Exterior Doors	Metal/Metal Clad	12	23	18	20
6.25	Ventilation/Exhaust Fan(s)		12	21	17	n/a
6.26	Heating System		14	25	20	n/a
6.27	CO Control System		10	15	13	n/a
6.28	Sprinklers	Dry	17	30	24	n/a
6.29		Wet	18	30	24	n/a
6.30	Fire Extinguishers		7	17	12	n/a
6.31	Fire Hoses		8	16	12	n/a

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COMPARISON OF MAIN SURVEY RESULTS TO ONTARIO HOUSING CORPORATION LIFE EXPECTANCY GUIDELINES

Ref. No.	Building Element	Material or Equipment Type	Service Life Low End Average (Yrs.)	Service Life High End Average (Yrs.)	Median Service Life (L+H)/2 (Yrs.)	Ontario Housing Corporation Life Expectancy* (Yrs.)
	ELECTRICAL SYSTEMS					
7.1	**Transformer Vault**		25	39	32	n/a
7.2	**Main Panel**	Circuit Breaker	20	31	26	15 (general)
7.3		Fused Switch	19	29	24	15 (general)
7.4	**Intermediate Panel**	Circuit Breaker	19	29	24	15 (general)
7.5		Fused Switch	18	28	23	15 (general)
7.6	**Transformers**	Delta Configuration	20	27	24	25
7.7		"Y" Configuration	20	27	24	25
7.8	**Suite Panel**	Plug Fuse	17	28	23	15 (general)
7.9		Circuit Breaker	18	30	24	15 (general)
7.10	**Metering**	Bulk	25	56	41	n/a
7.11		Individual	24	37	31	n/a
7.12	**Distribution**	Bus Duct	27	41	34	15 (general)
7.13		Cable	27	42	35	15 (general)
7.14	**Wiring**	Copper	24	39	32	25
7.15		Aluminum	19	41	30	25
7.16	**Fire Alarm (Updated)**	Control/Annuciator Panel	15	23	19	15
7.17		Pull Stations	16	27	22	15
7.18		Alarm Devices (Bells, Horns, Speakers)	15	26	21	15
7.19	**Smoke Detector**	Battery Powered	6	11	9	15
7.20		Hard Wired	10	18	14	15
7.21	**Heat Detector**		11	19	15	15
7.22	**Emergency Power**	Battery	6	10	8	15
7.23		Generator - Diesel	21	32	27	25
7.24		Generator - Gas	19	28	24	25
7.25	**Building Entry System**	Intercom System	13	21	17	15
7.26		Panel Connected to Telephone System	16	31	24	n/a
7.28	**Entry Security System**	Card Reader System	10	17	14	15
7.29		Closed Circuit Camera System	9	15	12	15
7.30	**Television**	Master Antenna	14	19	17	15
7.31		Cable	17	24	21	n/a
7.32		Satellite Dish	9	17	13	n/a
7.33	**Lighting Fixtures**		14	22	18	10
7.34	**Common Area**	24-Hr. Oper.: Fluorescent	10	16	13	10
7.35		24-Hr. Oper.: Incandescent	11	16	14	10
7.36		Non-24 Hr. Oper.: Fluorescent	10	16	13	10
7.37		Non-24 Hr. Oper.: Incandescent	11	16	14	10
7.38	**Service Area**	24-Hr. Oper.: Fluorescent	10	16	13	10
7.39		24-Hr. Oper.: Incandescent	12	17	15	10
7.40		Non-24 Hr. Oper.: Fluorescent	11	17	14	10
7.41		Non-24 Hr. Oper.: Incandescent	11	16	14	10
7.42	**Exterior**	Fluorescent	7	11	9	15
7.43		Incandescent	7	11	9	15
7.44		High Intensity Discharge (HID)	12	18	15	15

*The information below is dated February 29, 1996. It is accompanied by this note: "The following life expectancy information is intended to be used as a guide only and is considered to be representative of the average useful life of building elements under normal operating conditions. It is not a substitute for informed decision making based on element specific information; the actual life span of any building element may vary considerably depending on the service conditions it is subjected to, the design, the quality of materials used, the quality of installation, the environment and the level of applied maintenance".

COMPARISON OF MAIN SURVEY RESULTS TO ONTARIO HOUSING CORPORATION LIFE EXPECTANCY GUIDELINES

Ref. No.	Building Element	Material or Equipment Type	Service Life Low End Average (Yrs.)	Service Life High End Average (Yrs.)	Median Service Life (L+H)/2 (Yrs.)	Ontario Housing Corporation Life Expectancy* (Yrs.)
	MECHANICAL SYSTEMS					
8.1	Heating System Using:	Oil	18	26	22	20
8.2		Gas	17	26	22	20
8.3		Electric	20	29	25	20
8.4	Central System	Hot Water	20	30	25	25
8.5		Water Heat Pump	11	18	15	15
8.6		Steam	21	32	27	20
8.7		Central Chiller	19	28	24	n/a
8.8	Heating in Suite	Radiation - Electric	18	28	23	20
8.9		Radiation - Hydronic	22	32	27	25
8.10		Fan Coil - Electric	14	21	18	20
8.11		Fan Coil - Hydronic	15	25	20	25
8.12		Air to Air Heat Pump	11	17	14	15
8.13		Incremental Unit	11	18	15	n/a
8.14		Individual Controls	11	19	15	15
8.15	Cooling	Centrifugal Chiller	19	27	23	15 to 20 (general)
8.16		Absorption Chiller	16	19	18	15 to 20 (general)
8.17		Open Loop Cooling Tower	20	28	24	15 to 20 (general)
8.18		Closed Loop Cooling Tower	20	28	24	15 to 20 (general)
8.19		Roof Mounted Air Cooled Water Chiller	15	20	18	15 to 20 (general)
8.20	Pipe Distribution	Pumps	8	17	13	25
8.21	(Heating/Cooling Syst.)	Chemical Treatment	8	14	11	15
8.22		Controls	11	19	15	15
8.23		Valves	11	19	15	20
8.24		Pipes	19	32	26	20
8.25		Insulation	18	30	24	20
8.26	Corridor Air Make Up	Fan Only	9	18	14	15 (general)
8.27		Built-Up Unit (BUU)- Heated: Gas-Fired Unit	14	22	18	15 (general)
8.28		BUU - Heated: Glycol Coil	15	22	19	15 (general)
8.29		BUU - Heated: Hot Water Coil	16	23	20	15 (general)
8.30		BUU - Cooled: Direct Expansion System	15	23	19	15 (general)
8.31		BUU - Cooled: Chilled Water Coil	15	22	19	15 (general)
8.32		BUU - Cooled: Other	16	23	20	15 (general)
8.33		Roof Top Combined Unit Heated:Gas-Fired Unit	15	22	19	15 (general)
8.34		RTCU - Heated: Glycol Coil	14	21	18	15 (general)
8.35		RTCU - Heated: Hot Water Coil	14	20	17	15 (general)
8.36		RTCU - Cooled: Direct Expansion System	14	20	17	15 (general)
8.37		RTCU - Cooled: Chilled Water Coil	14	21	18	15 (general)
8.38		RTCU - Cooled: Other	14	19	17	15 (general)
8.39	Roof Top Exhaust Fans	Central Duct System	16	24	20	20
8.40		In-Suite Bathroom Fan(s)	11	19	15	15
8.41		In-Suite Kitchen Fan(s)	11	18	15	15

*The information below is dated February 29, 1996. It is accompanied by this note: "The following life expectancy information is intended to be used as a guide only and is considered to be representative of the average useful life of building elements under normal operating conditions. It is not a substitute for informed decision making based on element specific information; the actual life span of any building element may vary considerably depending on the service conditions it is subjected to, the design, the quality of materials used, the quality of installation, the environment and the level of applied maintenance".

COMPARISON OF MAIN SURVEY RESULTS TO ONTARIO HOUSING CORPORATION LIFE EXPECTANCY GUIDELINES

Ref. No.	Building Element	Material or Equipment Type	Service Life Low End Average (Yrs.)	Service Life High End Average (Yrs.)	Median Service Life (L+H)/2 (Yrs.)	Ontario Housing Corporation Life Expectancy* (Yrs.)
	MECHANICAL SYSTEMS	(Continued)				
8.42	Domestic Cold Water	Booster Pump	12	19	16	20
8.43		Meter	17	28	23	20
8.44		Copper Pipes	25	38	32	25
8.45		Galvanized Pipes	19	29	24	15
8.46		PVC Pipes	21	33	27	n/a
8.47		Suite Shut Off	14	23	19	15
8.48		Riser Shut Off	14	25	20	15
8.49	Domestic Hot Water	Central Oil	12	18	15	12 (general)
8.50		Central Gas	13	21	17	12 (general)
8.51		Central Electric	15	23	19	12 (general)
8.52		In-Suite Oil	10	15	13	12 (general)
8.53		In-Suite Gas	12	19	16	12 (general)
8.54		In-Suite Electric	10	15	13	12 (general)
8.55		Central Tank Lining	12	21	17	12 (general)
8.56		Central Tank Sterilization	5	9	7	n/a
8.57		Suite Shut Off	14	22	18	20
8.58		Riser Shut Off	14	22	18	20
8.59		Recirculating System	14	21	18	20
8.60	Sprinkler	Pumps	16	24	20	25 (general)
8.61		Dry Valves	18	32	25	25 (general)
8.62		Wet Valves	19	32	26	25 (general)
8.63		Valve Control Devices	14	21	18	25 (general)
8.64		Sprinkler Heads	20	34	27	25 (general)
8.65		Pipes	19	32	26	25 (general)
8.66	Fire Hose Cabinets	Access Doors	22	32	27	n/a
8.67		Hose	10	18	14	10
8.68		Fire Extinguishers	8	17	13	10
8.69		Valves/Hoses/ Nozzles	13	22	18	n/a
8.70	Sanitary Sewer	Cast Iron	27	42	35	25 (general)
8.71		Copper	26	40	33	25 (general)
8.72		Aluminum	27	38	33	25 (general)
8.73		PVC	21	35	28	25 (general)
8.74	Storm Sewer	Concrete Transite Pipe	24	37	31	25 (general)
8.75		Cast Iron Pipe	28	45	37	25 (general)
8.76		Area/Roof Drains - Full Flow	24	36	30	25 (general)
8.77		Area/Roof Drains - Control Flow	24	35	30	25 (general)
8.78		Catch Basins	22	37	30	25 (general)
8.79	Garbage Chute	Aluminum	20	27	24	n/a
8.80	(UL Rated)	Stainless Steel	21	32	27	n/a
8.81		Welded	26	38	32	n/a
8.82		Riveted	19	48	34	n/a
8.83		Self Latching Doors	8	16	12	n/a
8.84		Self Closing Doors	8	15	12	n/a
8.85		Fire Rated Doors	12	20	16	n/a
8.86	Compactor		14	22	18	15

*The information below is dated February 29, 1996. It is accompanied by this note: "The following life expectancy information is intended to be used as a guide only and is considered to be representative of the average useful life of building elements under normal operating conditions. It is not a substitute for informed decision making based on element specific information; the actual life span of any building element may vary considerably depending on the service conditions it is subjected to, the design, the quality of materials used, the quality of installation, the environment and the level of applied maintenance".

COMPARISON OF MAIN SURVEY RESULTS TO ONTARIO HOUSING CORPORATION LIFE EXPECTANCY GUIDELINES

Ref. No.	Building Element	Material or Equipment Type	Service Life Low End Average (Yrs.)	Service Life High End Average (Yrs.)	Median Service Life (L+H)/2 (Yrs.)	Ontario Housing Corporation Life Expectancy* (Yrs.)
	SWIMMING POOLS					
9.1	Swimming Pools	Filtration System	10	16	13	15
9.2		Pool Deterioration due to Moisture	8	12	10	15 to 20
9.3		Major Cracking/Leakage	11	16	14	15 to 20
9.4		Water Supply/Drainage System	14	22	18	15

* The information below is dated February 29, 1996. It is accompanied by this note: "The following life expectancy information is intended to be used as a guide only and is considered to be representative of the average useful life of building elements under normal operating conditions. It is not a substitute for informed decision making based on element specific information; the actual life span of any building element may vary considerably depending on the service conditions it is subjected to, the design, the quality of materials used, the quality of installation, the environment and the level of applied maintenance".

APPENDIX E

Calculation of Capital Replacement Cash Flows and Annual Reserve Fund Contribution

APPENDIX E

CALCULATION OF CAPITAL REPLACEMENT CASH FLOWS AND ANNUAL RESERVE FUND CONTRIBUTION

The attached table is an automated spreadsheet designed to reflect the capital replacement cash flows for the model apartment building. The cash flows take into account the service life, assuming a high end average length of service life. In addition, the spreadsheet demonstrates how to calculate minimum contribution to a reserve fund that will maintain appropriate balance until beginning of the last 5 years of desired life of the building.

The assumptions and features of the calculations are as follows:

1. The appropriate building elements for the model building are listed.

2. The service life of each of these elements is listed.

3. The building element/equipment cost per dwelling unit is shown.

4. It is assumed that the building is new and will have a total service life of 40 years.

5. The demand for cash for capital replacements is assumed to occur up to the end of year 35. During the last 5 years of building life, it is not proposed to make any capital replacements. Instead, those elements requiring replacement will be repaired to last the remaining 1, 2, 3, 4, or 5 years until the building is demolished or reconfigured.

6. It is assumed that construction inflation is 5% per year during the analysis period. This means that at the time of replacement for each element, the initial replacement cost (1999$) has been escalated by 5% per year to provide the current cost for replacement.

7. The bottom 5 lines on pages 3 and 4 of the tables demonstrate how the cash flows are computed, how the reserve fund is built up, the expenditure in the current year, and the interest provided on the invested balance. More specifically, these lines are as follows:

   - Line 1 shows the escalation factor for the annual contribution, which corresponds to the assumed construction inflation rate. In this case the figure is 5%.

   - Line 2 shows the balance at the beginning of each year in the reserve fund account, based on the amount that is computed below to set the balance in the reserve fund at 0 at the end of year 35.

   - The 3rd line indicates the reserve fund contribution at the beginning of each year. As indicated above, this contribution is increased by the construction inflation rate.

   - Line 4 shows the total required expenditure for capital replacement each year, taking into account the building element service life and the construction cost

inflation factor. All of these expenditures are shown as negatives, with the amount in brackets.

- Line 5 shows the interest on the minimum balance in the reserve fund account for the year in question. That minimum balance is computed by taking the beginning balance (line 2) adding the contribution to the reserve fund at the beginning of the year (line 3), and deducting the expenditure for the current year (line 4). The interest is computed based on 6% per annum in this example, on the sum of lines 2 and 3 less the expenditure in line 4.

8. The necessary contribution to have the reserve fund result in a 0 amount at the end of year 35 is computed on a trial and error basis (done very quickly using the spreadsheet software).

9. Note that in some cases the balance after expenditures in the current year is less than 0. In this case, it means that at least a portion of the expenditures for that year has to be borrowed and the interest rate for the borrowing is assumed to be the same as that for which a positive balance would be invested.

Service Life of Multi-Unit Residential Building Elements and Equipment

Template showing Annual Reserve Fund Contribution per Dwelling Unit by Element / Equipment For Model Building

Annual Cash Flow of Model Building: HIGH END Average - (40 YEARS Building Life / Analysis Cutoff at Year 35)

Ref. No.	Building Element	Material or Equipment Type	Service Life (Yrs.)	Bldg. Component Element Equipment Cost/ Dwelling Unit (1999 $)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2.01	Exterior Walls	Precast Concrete Panels	49	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.02	Exterior Walls	Brick Veneer	42	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.03	Exterior Walls	Curtain Wall	44	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.04	Exterior Walls	Stucco	25	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.05	Balcony Decks	Concrete	29	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.06	Balcony Decks	Concrete Topping/Waterproofing	20	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$159
2.1	Balcony Railings	Glass Panels with Steel/Metal	27	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.5	Windows	Metal Sliding	27	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.16	Doors (Exterior/Balcony)	Sliding Metal/Glass	24	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.18	Caulking		13	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,896	$0	$0	$0	$0	$0	$0	$0
2.19	Exposed Flashing	Sheet Metal	29	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.01	Ceilings: Common Area	Painted Concrete	36	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.03	Ceilings: Common Area	Drywall	27	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.06	Ceilings: Service Area	Drywall	27	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.08	Walls: Common Area	Concrete Block Painted	36	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.09	Walls: Common Area	Drywall	29	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.1	Walls: Common Area	Ceramic Tiles	27	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.13	Walls: Service Area	Concrete Block Painted	37	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.14	Walls: Service Area	Drywall	25	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.15	Floors: Common Area	Ceramic Tiles	29	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.16	Floors: Common Area	Carpetng	12	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$584	$0	$0	$0	$0	$0	$0	$0
3.17	Floors: Common Area	Terrazzo	47	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.19	Floors: Service Area	Concrete	38	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.21	Stairway Treads	Concrete	38	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.23	Stairway Handrails	Painted Iron	26	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.24	Doors: Common Area	Hollow Metal/Metal Clad	26	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.26	Doors: Service Area	Hollow Metal/Metal Clad	25	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.27	Doors: Units	Wood/Wood Composite	23	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$76	$0
3.28	Plumbing Fixtures	Common Laundry Facilities	19	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.29	Plumbing Fixtures	Janitor's Room(s)	24	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.01	Elevator	Hoisting Equipment	30	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$782	$0
4.05	Elevator	Interior Finishes of Cab	18	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5.02	Roofs (Conventional)	Built-up Roofing (BUR)	24	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5.07	Parapets	Concrete	33	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5.08	Base & Cap Flashing	Sheet Metal	24	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	UNDERGROUND Parking Garage																							
6.14	Walls	Waterproofing	30	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.15	Walls	Structural Failure	44	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.16	Columns	Structural Failure	45	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.17	Drainage System		35	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,263	$0
6.19	Lighting Fixtures "	Fluorescent	19	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$143
6.22	Overhead Doors	Steel	20	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.24	Exterior Doors	Metal/Metal Clad	23	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.25	Ventilation/Exhaust Fan(s)		21	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.26	Heating System		25	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$561	$0	$0	$0	$0	$0
6.27	CO Control System		15	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.28	Sprinklers	Dry	30	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$16	$0	$0	$0
6.3	Fire Extinguishers		17	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$382	$0	$0	$0	$0	$0
6.31	Fire Hoses		16	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	Electrical Systems																							
7.03	Main Panel	Fused Switch	29	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.05	Intermediate Panel	Fused Switch	28	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

Service Life of Multi-Unit Residential Building Elements and Equipment

Template showing Annual Reserve Fund Contribution per Dwelling Unit by Element / Equipment For Model Building

Annual Cash Flow of Model Building: HIGH END Average - (40 YEARS Building Life /

Ref. No.	Building Element	Material or Equipment Type	Service Life (Yrs.)	Bldg. Component Element Equipment Cost/ Dwelling Unit (1999 $)	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
2.01	Exterior Walls	Precast Concrete Panels	49	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.02	Exterior Walls	Brick Veneer	42	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.03	Exterior Walls	Curtain Wall	44	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.04	Exterior Walls	Stucco	25	[illegible]	$0	$0	$0	$0	$1,449	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.05	Balcony Decks	Concrete	29	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$720	$0	$0	$0	$0	$0	$0
2.06	Balcony Decks	Concrete Topping/Waterproofing	30	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.1	Balcony Railings	Glass Panels with Steel/Metal	27	[illegible]	$0	$0	$0	$0	$0	$0	$2,240	$0	$0	$0	$0	$0	$0	$0	$0
2.15	Windows	Metal Sliding	27	[illegible]	$0	$0	$0	$0	$0	$0	$5,974	$0	$0	$0	$0	$0	$0	$0	$0
2.16	Doors (Exterior/Balcony)	Sliding Metal/Glass	24	[illegible]	$0	$0	$0	$2,258	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.18	Caulking		13	[illegible]	$0	$0	$0	$0	$0	$3,556	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.19	Exposed Flashing	Sheet Metal	29	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$617	$0	$0	$0	$0	$0	$0
3.01	Ceilings: Common Area	Painted Concrete	36	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.03	Ceilings: Common Area	Drywall	27	[illegible]	$0	$0	$0	$0	$0	$0	$1,867	$0	$0	$0	$0	$0	$0	$0	$0
3.06	Ceilings: Service Area	Drywall	27	[illegible]	$0	$0	$0	$0	$0	$0	$1,867	$0	$0	$0	$0	$0	$0	$0	$0
3.08	Walls: Common Area	Concrete Block Painted	36	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.09	Walls: Common Area	Drywall	29	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$1,029	$0	$0	$0	$0	$0	$0
3.1	Walls: Common Area	Ceramic Tiles	27	[illegible]	$0	$0	$0	$0	$0	$0	$86	$0	$0	$0	$0	$0	$0	$0	$0
3.13	Walls: Service Area	Concrete Block Painted	37	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.14	Walls: Service Area	Drywall	25	[illegible]	$0	$0	$0	$0	$261	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.15	Floors: Common Area	Ceramic Tiles	29	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$41	$0	$0	$0	$0	$0	$0
3.16	Floors: Common Area	Carpeting	12	[illegible]	$0	$0	$0	$1,048	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.17	Floors: Common Area	Terrazzo	47	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.19	Floors: Service Area	Concrete	38	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.21	Stairway Treads	Concrete	38	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.23	Stairway Handrails	Painted Iron	26	[illegible]	$0	$0	$0	$0	$0	$0	$956	$0	$0	$0	$0	$0	$0	$0	$0
3.24	Doors: Common Area	Hollow Metal/Metal Clad	26	[illegible]	$0	$0	$0	$0	$0	$775	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.26	Doors: Service Area	Hollow Metal/Metal Clad	25	[illegible]	$0	$0	$0	$0	$386	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.27	Doors: Units	Wood/Wood Composite	23	[illegible]	$0	$0	$8,936	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.28	Plumbing Fixtures	Common Laundry Facilities	19	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.29	Plumbing Fixtures	Janitor's Room(s)	24	[illegible]	$0	$0	$0	$32	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.01	Elevator	Hoisting Equipment	30	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$11,712	$0	$0	$0	$0	$0
4.05	Elevator	Interior Finishes of Cab	18	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5.02	Roofs (Conventional)	Built-up Roofing (BUR)	24	[illegible]	$0	$0	$0	$2,183	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5.07	Parapets	Concrete	33	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5.08	Base & Cap Flashing	Sheet Metal	24	[illegible]	$0	$0	$0	$381	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	UNDERGROUND Parking Garage																		
6.14	Walls	Waterproofing	30	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$730	$0	$0	$0	$0	$0
6.15	Walls	Structural Failure	44	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.16	Columns	Structural Failure	45	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,655
6.17	Drainage System		35	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.19	Lighting Fixtures *	Fluorescent	19	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.22	Overhead Doors	Steel	20	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.24	Exterior Doors	Metal/Metal Clad	23	[illegible]	$0	$0	$31	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.25	Ventilation/Exhaust Fan(s)		21	[illegible]	$418	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.26	Heating System		25	[illegible]	$0	$0	$0	$0	$37	$0	$0	$0	$0	$1,167	$0	$0	$0	$0	$0
6.27	CO Control System		15	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,852	$0	$0	$0	$0	$0
6.28	Sprinklers	Dry	30	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$37	$0
6.3	Fire Extinguishers		17	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$834	$0	$0	$0
6.31	Fire Hoses		16	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	Electrical Systems																		
7.03	Main Panel	Fused Switch	29	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$996	$0	$0	$0	$0	$0	$0
7.05	Intermediate Panel	Fused Switch	28	[illegible]	$0	$0	$0	$0	$0	$0	$0	$862	$0	$0	$0	$0	$0	$0	$0

Service Life of Multi-Unit Residential Building Elements and Equipment

Template showing Annual Reserve Fund Contribution per Dwelling Unit by Element / Equipment For Model Building

Annual Cash Flow of Model Building: HIGH END Average - (40 YEARS Building Life / Analysis Cutoff at Year 35)

Ref. No.	Building Element	Material or Equipment Type	Service Life (Yrs.)	Bldg. Component Element Equipment Cost/ Dwelling Unit (1999 $)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
7.07	Transformers	"Y" Configuration	27	$600	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.09	Suite Panel	Circuit Breaker	36	$250	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.1	Metering	Built	56	$200	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.13	Distribution	Cable	42	$450	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.14	Wiring	Copper	39	$2,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.16	Fire Alarm (Updated)	Control/Annunciator Panel	23	$250	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.17	Fire Alarm (Updated)	Pull Stations	27	$100	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.18	Fire Alarm (Updated)	Alarm Devices (Bells, Horns, Speakers)	26	$1,200	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$34	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.19	Smoke Detector	Battery Powered	11	$265	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$144	$0	$0
7.2	Smoke Detector	Hard Wired	18	$400	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$152	$0
7.21	Heat Detector		19	$300	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.23	Emergency Power	Generator - Diesel	33	$4,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.26	Building Entry System	Panel Connected to Telephone System	31	$750	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,375	$0	$0	$0
7.28	Entry Security System	Card Reader System	17	$600	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$520	$0	$0	$0	$0	$0
7.29	Entry Security System	Closed Circuit Camera System	15	$1,100	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.31	Television	Cable	24	$110	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.33	Lighting Fixtures		22	$400	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$415	$0	$0	$0	$0
7.34	Lighting Fixtures: Common Area	24-Hr. Oper.: Fluorescent	16	$150	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$175	$0	$0	$0	$0
7.38	Lighting Fixtures: Service Area	24-Hr. Oper.: Fluorescent	16	$80	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$84	$0	$0
7.44	Lighting Fixtures: Exterior	High Intensity Discharge (HID)	18	$525	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.02	Heating System Unreg	Gas	26	$1,020	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.11	Heating in Suite	Fan Coil - Hydronic	25	$1,360	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.15	Cooling	Centrifugal Chiller	27	$860	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.18	Cooling	Closed Loop Cooling Tower	28	$700	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$211	$0	$0	$0	$0
8.2	Pipe Distribution (Heating/Cooling Syst.)	Pumps	17	$95	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$61	$0	$0	$0	$0	$0	$0
8.21	Pipe Distribution (Heating/Cooling Syst.)	Chemical Treatment	14	$35	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$783	$0
8.22	Pipe Distribution (Heating/Cooling Syst.)	Controls	19	$310	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$581	$0
8.23	Pipe Distribution (Heating/Cooling Syst.)	Valves	19	$120	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.24	Pipe Distribution (Heating/Cooling Syst.)	Pipes	32	$400	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.25	Pipe Distribution (Heating/Cooling Syst.)	Insulation	30	$170	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.3	Corridor Air Make Up	BHU - Cooled: Direct Expension System	23	$400	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.39	Roof Top Exhaust Fans	Central Duct System	24	$270	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,011	$0
8.4	Roof Top Exhaust Fans	In-Suite Bathroom Fan(s)	19	$400	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,203	$0
8.41	Roof Top Exhaust Fans	In-Suite Kitchen Fan(s)	18	$500	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$232
8.42	Domestic Cold Water	Booster Pump	19	$800	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.43	Domestic Cold Water	Meter	28	$65	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.44	Domestic Cold Water	Copper Pipes	38	$270	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.46	Domestic Cold Water	PVC Pipes	33	$400	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.47	Domestic Cold Water	Suite Shut Off	23	$175	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.5	Domestic Hot Water	Central Gas	21	$550	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.57	Domestic Hot Water	Suite Shut Off	22	$175	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.6	Sprinkler	Pumps	24	$900	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.64	Sprinkler	Sprinkler Heads	34	$60	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$469	$0
8.67	Fire Hose Cabinets	Hose	18	$395	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.7	Sanitary Sewer	Cast Iron	42	$100	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.76	Storm Sewer	Area/Roof Drains - Full Flow	36	$88	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.86	Compactor		22	$600	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total					$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$34	$584	$1,886	$61	$1,081	$971	$1,602	$2,683	$4,099	$302
1	Escalation of Annual Contribution		5.0%	Per Annum	1.05	1.10	1.16	1.22	1.28	1.34	1.41	1.48	1.55	1.63	1.71	1.80	1.89	1.98	2.08	2.18	2.29	2.41	2.53	2.65
2	Beginning Balance				$0	$909	$1,919	$3,036	$4,271	$5,633	$7,131	$8,778	$10,584	$12,562	$14,727	$17,055	$19,015	$19,790	$22,627	$24,639	$26,979	$28,884	$29,857	$29,492
3	Contribution at the Beginning of the Year			$817	$858	$901	$946	$993	$1,043	$1,095	$1,150	$1,207	$1,267	$1,331	$1,397	$1,467	$1,541	$1,618	$1,698	$1,783	$1,873	$1,966	$2,065	$2,168
4	Expenditure in Current Year				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	($34)	($584)	($1,886)	($61)	($1,081)	($971)	($1,602)	($2,683)	($4,099)	($302)
5	Interest at		6.0%	Per Annum	$51	$109	$172	$242	$319	$404	$497	$599	$711	$834	$965	$1,076	$1,120	$1,281	$1,395	$1,527	$1,635	$1,698	$1,669	$1,881
	Closing Balance at Year	35		$986	$909	$1,919	$3,036	$4,271	$5,633	$7,131	$8,778	$10,584	$12,562	$14,727	$17,055	$19,015	$19,790	$22,627	$24,639	$26,979	$28,884	$29,857	$29,492	$33,239

Service Life of Multi-Unit Residential Building Elements and Equipment

Template showing Annual Reserve Fund Contribution per Dwelling Unit by Element / Equipment For Model Building

Annual Cash Flow of Model Building: HIGH END Average - (40 YEARS Building Life /

Ref. No.	Building Element	Material or Equipment Type	Service Life (Yrs.)	Bldg. Component Element Equipment Cost/ Dwelling Unit (1999 $)	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
7.07	Service Wiring	Precast/Separate Panels	40	[illegible]	$0	$0	$0	$0	$0	$0	$747	$0	$0	$0	$0	$0	$0	$0	$0
7.09	Suite Panel	Circuit Breaker	30	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,080	$0	$0	$0	$0	$0
7.1	Metering	Bulk	56	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.13	Distribution	Cable	42	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.14	Wiring	Copper	39	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.16	Fire Alarm (Updated)	Control/Annuciator Panel	23	[illegible]	$0	$0	$768	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.17	Fire Alarm (Updated)	Pull Stations	27	[illegible]	$0	$0	$0	$0	$0	$0	$373	$0	$0	$0	$0	$0	$0	$0	$0
7.18	Fire Alarm (Updated)	Alarm Devices (Bells, Horns, Speakers)	26	[illegible]	$0	$0	$0	$0	$0	$711	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.19	Smoke Detector	Battery Powered	11	[illegible]	$0	$59	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$100	$0	$0
7.2	Smoke Detector	Hard Wired	18	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.21	Heat Detector		19	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.23	Emergency Power	Generator - Diesel	32	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,149	$0	$0	$0
7.26	Building Entry System	Panel Connected to Telephone Syste	31	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,135	$0	$0	$0	$0
7.28	Entry Security System	Card Reader System	17	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,152	$0
7.29	Entry Security System	Closed Circuit Camera System	15	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,080	$0	$0	$0	$0	$0
7.31	Television	Cable	24	[illegible]	$0	$0	$0	$355	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.33	Lighting Fixtures		22	[illegible]	$0	$1,316	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.34	Lighting Fixtures: Common Area	24-Hr. Oper.: Fluorescent	16	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$905	$0	$0	$0
7.38	Lighting Fixtures: Service Area	24-Hr. Oper.: Fluorescent	16	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$381	$0	$0	$0
7.44	Lighting Fixtures: Exterior	High Intensity Discharge (HID)	18	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.02	Heating System Using:	Gas	26	[illegible]	$0	$0	$0	$0	$0	$1,138	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.11	Heating in Suite	Fan Coil - Hydronic	25	[illegible]	$0	$0	$0	$0	$5,080	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.15	Cooling	Centrifugal Chiller	27	[illegible]	$0	$0	$0	$0	$0	$0	$3,211	$0	$0	$0	$0	$0	$0	$0	$0
8.18	Cooling	Closed Loop Cooling Tower	28	[illegible]	$0	$0	$0	$0	$0	$0	$0	$2,744	$0	$0	$0	$0	$0	$0	$0
8.2	Pipe Distribution (Heating/Cooling Syst.)	Pumps	17	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$483	$0
8.21	Pipe Distribution (Heating/Cooling Syst.)	Chemical Treatment	14	[illegible]	$0	$0	$0	$0	$0	$0	$0	$122	$0	$0	$0	$0	$0	$0	$0
8.22	Pipe Distribution (Heating/Cooling Syst.)	Controls	19	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.23	Pipe Distribution (Heating/Cooling Syst.)	Valves	19	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.24	Pipe Distribution (Heating/Cooling Syst.)	Pipes	32	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,906	$0	$0	$0
8.25	Pipe Distribution (Heating/Cooling Syst.)	Insulation	30	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$735	$0	$0	$0	$0	$0
8.3	Corridor Air Make Up	BUU - Cooled: Direct Expansion System	23	[illegible]	$0	$0	$1,290	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.39	Roof Top Exhaust Fans	Central Duct System	24	[illegible]	$0	$0	$0	$871	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.4	Roof Top Exhaust Fans	In-Suite Bathroom Fan(s)	19	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.41	Roof Top Exhaust Fans	In-Suite Kitchen Fan(s)	18	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.42	Domestic Cold Water	Booster Pump	19	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.43	Domestic Cold Water	Meter	28	[illegible]	$0	$0	$0	$0	$0	$0	$0	$247	$0	$0	$0	$0	$0	$0	$0
8.44	Domestic Cold Water	Copper Pipes	38	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.46	Domestic Cold Water	PVC Pipes	33	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,901	$0	$0
8.47	Domestic Cold Water	Suite Shut Off	23	[illegible]	$0	$0	$522	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.5	Domestic Hot Water	Central Gas	21	[illegible]	$343	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.57	Domestic Hot Water	Suite Shut Off	22	[illegible]	$0	$497	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.6	Sprinkler	Pumps	24	[illegible]	$0	$0	$0	$194	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.64	Sprinkler	Sprinkler Heads	34	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$263	$0
8.67	Fire Hose Cabinets	Hose	18	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.7	Sanitary Sewer	Cast Iron	42	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.76	Storm Sewer	Area/Roof Drains - Full Flow	36	[illegible]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8.86	Compactor		22	[illegible]	$0	$293	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total					$761	$2,165	$9,546	$7,321	$7,213	$7,136	$16,364	$3,975	$3,404	$19,358	$1,135	$6,175	$4,933	$3,935	$1,655

1. Escalation of Annual Contribution	5.0% Per Annum	2.79	2.93	3.07	3.23	3.39	3.56	3.73	3.92	4.12	4.32	4.54	4.76	5.00	5.25	5.52		
2. Beginning Balance		$33,239	$36,839	$39,289	$34,187	$31,271	$28,434	$25,655	$13,082	$13,048	$13,787	($2,162)	$436	($1,957)	($2,971)	($2,771)		
3. Contribution at the Beginning of the Year	$817	$2,276	$2,390	$2,509	$2,635	$2,767	$2,905	$3,050	$3,203	$3,363	$3,531	$3,708	$3,893	$4,088	$4,292	$4,507		
4. Expenditure in Current Year		($761)	($2,165)	($9,546)	($7,321)	($7,213)	($7,136)	($16,364)	($3,975)	($3,404)	($19,358)	($1,135)	($6,175)	($4,933)	($3,935)	($1,655)		
5. Interest at	6.0% Per Annum	$2,085	$2,224	$1,935	$1,770	$1,609	$1,452	$740	$739	$780	($122)	$25	($111)	($168)	($157)	$5		
Closing Balance		$36,839	$39,289	$34,187	$31,271	$28,434	$25,655	$13,082	$13,048	$13,787	($2,162)	$436	($1,957)	($2,971)	($2,771)	$86		
at Year	35	$86																